Structural Monitoring
Equipment List

- when it has to be **right**

Leica Geosystems

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GeoMoS Modules

GeoMoS – Geodetic and geotechnical Monitoring Solutions

GeoMoS comprises the following modules:

Leica GeoMoS		User Versions				Demo Version (1 year)
Article Name		GeoMoS Monitor	GeoMoS Analyzer	GeoMoS Web	GeoMoS Adjustment	GeoMoS Demo
Article Number (SAP)		758 749	723 366	5001892	772 767	724 933
CD-ROM included	723 367	●	●	–	●	●
USB Dongle (default)	734 713	●	●	–	●	●
Parallel Dongle (optional)	734 712	o	o	–	o	o
Sensor License	758 750	o	–	–	–	●
Monitor Option 1 (Computation)	758 751	o	–	–	–	●
Monitor Option 2 (Limit checks/Messaging)	758 752	o	–	–	–	●
Monitor Option 3 (Export Service for GeoMoS Adjustment)	773 056	o	–	–	●	–
Analyzer Option 1 (TPS Post-Processing)	758 753	–	o	–	–	●
Quarterly Subscription Per Point	5 302 475	–	–	●	–	–
Administration Fee	5 001 893	–	–	●	–	–

Legend	
●	included: automatically, not removable
o	optional
–	not available

Software protection keys

734 712	Software protection key (parallel)
734 713	Software protection key (USB)

Upgrade

748 840	Upgrade from GeoMoS Version 1.55, 1.6, 2.0 and 2.1 to Version 5.0 (inclusive Upgrade from existing GeoMoS Options to new GeoMoS 5.0 Options).
CCP	Upgrade from GeoMoS Version 3.0, 3.1, 4.0, 4.1 to Version 5.0 (inclusive Upgrade from all Options).

1.1 GeoMoS Monitor (758 749)

GeoMoS Monitor is the monitoring software for the normal use of the customer. The customer can collect and store data. Additional options can be added later.

- Connection to sensors (serial or TCP/IP) with valid **Sensor Licenses**
- Project management
- User levels
- Learn points
- Manual stand point coordinate determination with Free Station, Distance Intersection or GNSS Update
- Automatic measurements with various options
- Blunder tolerance checks on raw data
- Information about the current system and measurement status
- Calculation of GNSS displacements and daily average results
- Automatic database export
- SQL Server 2005 Express database included

A number of options are available for the use together with GeoMoS Monitor:

758 751	GeoMoS Monitor Option 1 (Computation)
758 752	GeoMoS Monitor Option 2 (Limit checks and Messaging)
773 056	GeoMoS Monitor Option 3 (Export Service to GeoMoS Adjustment)

Note: Sensors can only connected to GeoMoS Monitor, if the required amount of sensor licenses has been ordered also. Refer to the section "1.2 Sensor License" for more detail.

Leica GeoMoS makes use of the Microsoft SQL database. With Leica GeoMoS the free version Microsoft SQL Server 2005 Express is provided and will be installed, if no SQL server is available.

1.1.1 GeoMoS Monitor Option 1 (758 751)

Computation	▪ Automatic total station stand point setup with different methods (Free Station, Distance Intersection or GNSS Update) ▪ Calculation of any total station results including coordinates, displacements, profiles, distance reduction ▪ Calculation of any total station correction with Free Station, Distance Intersection, Orientation, PPM and Vz Correction groups and associated point group properties ▪ Calculation of daily average results for total stations ▪ Computation of virtual sensors with constants, mathematical functions and/or logic operators.

1.1.2 GeoMoS Monitor Option 2 (758 752)

Limit checks and Messaging	▪ Automatic computation of limit checks ▪ Multiple levels of limit checks (yellow, orange, red) ▪ Limit Level 1, 2 and 3 can be assigned independent actions ▪ Four different types of limit check computation (absolute, short time, long time and regression) ▪ Allows emails and SMS to be sent, applications to be run, the database to be queried and digital outputs to be set when defined messages are generated by the system

1.1.3 GeoMoS Monitor Option 3 (773 056)

Export Service for GeoMoS Adjustment	▪ Manual and automatic GeoMoS data export in XML format

1.2 Sensor License (758 750)

The sensor license concept means that the software scales with the number and type of sensors you have connected. Additional sensor licenses can easily be added later should your needs change.

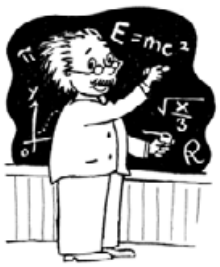
For each sensor you need to order a special amount of Sensor Licenses (Art. No. 758 750). The required amount of sensor licenses per sensor is listed below:

* Sensor License	Amount required per sensor
TPS Sensor	30
GNSS Sensor (NMEA)	10
Connection to a GNSS Spider Site Server with all Spider RT Positioning Products	10
Connection to a GNSS Spider Site Server with all Spider PP Positioning Products	10
Nivel200 Sensor	3
Digital Level	3
Temperature / Pressure Sensor (DTM STS)	1
Geotechnical Sensor connected via Campbell Scientific Datalogger	1

Note that each sensor requires sensor licenses even though the sensor is connected with a bus system (Nivel220) or Campbell Scientific datalogger (geotechnical sensor) to GeoMoS.

For more information about connectable sensors offering with GeoMoS Monitor please contact your local Leica Geosystems organization or distribution partner.

1.2.1 Sensor Licenses – Examples



Example 1:
Your customer wants to use a total station and a temperature sensor for monitoring with GeoMoS.
How many Sensor Licenses must he order?

1x TPS Sensor	30
1x Temperature Sensor (DTM STS)	01
Sensor Licenses (Art. No. 758 750)	31

Example 2:
Your customer wants to use a Nivel220 bus system with five sensors for monitoring with GeoMoS.
How many Sensor Licenses must he order?

5x Nivel200 Sensor	5 x 3
Sensor Licenses (Art. No. 758 750)	15

Example 3:
Your customer wants to use a combined TPS/GNSS monitoring system with a total station and GNSS Spider RT positioning products for monitoring with GeoMoS. Therefore five GNSS sensors are connected as passive LB2 and two GNSS sensors as active data streams to GNSS Spider.
How many Sensor Licenses must he order?

1x TPS Sensor	30
1x Connection to a GNSS Spider Site Server with all Spider RT Positioning Products	10
Sensor Licenses (Art. No. 758 750)	40

Note: The Spider RT Positioning Products computation requires additional Spider Positioning Site Licenses (Art. No. 744 912). Refer to "4.2.4 GNSS Spider".

Example 4:
Your customer wants to use a combined TPS/GNSS monitoring system with a total station and GNSS Spider RT and PP positioning products for monitoring with GeoMoS. The customer has 12 GNSS sensors are connected to GNSS Spider.
How many Sensor Licenses must he order?

1x TPS Sensor	30
1x Connection to a GNSS Spider Site Server with all Spider RT Positioning Products	10
1x Connection to a GNSS Spider Site Server with all Spider PP Positioning Products	10
Sensor Licenses (Art. No. 758 750)	50

Note: The Spider RT and PP Positioning Products computation requires additional Spider Positioning Site Licenses (Art. No. 744 912) and Spider File Products Service (FPS) option (Art. No. 744 904). Refer to "4.2.4 GNSS Spider".

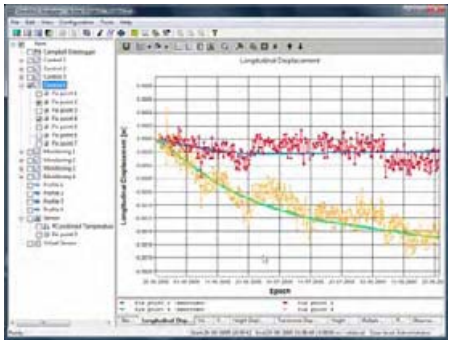
Example 5:
Your customer wants to use a Campbell Scientific Datalogger with different geotechnical sensors for monitoring with GeoMoS.
How many Sensor Licenses must he order?

Setup A	1 sensor measuring one value type (e.g. wind speed)	01
Setup B	1 sensor measuring three value types (e.g. temperature, pressure and humidity)	03
Setup C	1 sensor measuring one value type (e.g. wind speed) and 1 sensor measuring one value type (e.g. rain fall)	02
Setup D	5 sensors measuring three value types (e.g. temperature, pressure and humidity)	15

1.3 GeoMoS Analyzer (723 366)

GeoMoS Analyzer is an analysis tool that can be used to view data collected by any GeoMoS Monitor.

Note: For online analysis using GeoMoS Analyzer at a remote location there needs to be continual connection between GeoMoS Monitor and GeoMoS Analyzer computers.



- Graphical and numerical visualization of results
- More than one installation of Analyzer may access the data and do analysis simultaneously
- Project management
- User levels
- Outlier detection algorithm
- Set results invalid/valid
- Enter comments
- Customizable graphics
- Customizable reports with filter and search mechanism
- Manual database import and export
- Export to other systems e.g. ASCII, DXF and BMP
- SQL Server 2005 Express database included

A number of options are available for use together with GeoMoS Analyzer:

758 753 GeoMoS Analyzer Option 1 (TPS Post-Processing)

Leica GeoMoS makes use of the Microsoft SQL database. With Leica GeoMoS the free version Microsoft SQL Server 2005 Express is provided and will be installed, if no SQL server is available.

1.3.2 GeoMoS Analyzer Option 1 (758 753)

TPS post processing	▪ Re-processing of the coordinate system, distance reduction, meteo model and all values modified in the Data Editor ▪ Data Editor to modify additive constants, reflector heights, temperature and pressure ▪ Re-processing of the profile directions, instrument height and null coordinate together with GeoMoS Monitor

1.4 GeoMoS Demo (724 933)

GeoMoS Demo is only for demonstration purposes to sell the product. GeoMoS Demo is not for commercial sale. GeoMoS Demo has the same functionality as GeoMoS Monitor and GeoMoS Analyzer but cannot be used for permanent monitoring. The automatic measurement will only run for a limited time (TPS Sensor measurements = 100, geotechnical measurements = 500).

Note: GeoMoS Demo does not include Leica GeoMoS Adjustment and GeoMoS Monitor Option 3

1.5 GeoMoS Web (5 001 892)

Leica GeoMoS Web is a web based service for visualization and analysis of monitoring data collected by GeoMoS Monitor.

- Easy access through standard web browsers
- Graphical and visualization of monitoring data
- Overview and site maps
- Timeline, scatter and vector graphs
- View webcam images and web image
- User levels (admin, viewer)
- Customizable graphics
- Save raw data to comma separated files
- Personalized and secure data access
- No need to maintain IT infrastructure and software
- Physical and electronic security of data
- Protection against misusage
- Easy translation based on XML files

The Leica GeoMoS Web service is composed of:

- an one time only **Setup Fee** (Art. No. 5 001 892) and
- a quarterly **Subscription** (Art. No. 5 302 475) that scales with the size of the monitoring installation.

Leica GeoMoS Web		
5 001 892	GeoMoS Web Setup Fee	For the initial configuration of the service. Once only.
5 302 475	GeoMoS Web Quarterly Subscription Per Point	For access to the web service for a period of three months (90 days). One article is required for each monitoring point to be shown in the web. A minimum of 5 X Article **5 302 475** is required.

Billing

- An invoice will be sent each month or quarter for the amount of Quarterly Subscription Per Point's that were ordered.
- The service is paid per billing period (month / quarter).

Service Change Requests

The amount of Quarterly Subscription Per Point's of the Leica GeoMoS Web service can be changed at a month's notice for the next billing period. An administration fee (Article **5 001 893**) of 200.- CHF is incurred each time the number of points is increased. It is not possible to decrease the number of points.

Cancellation

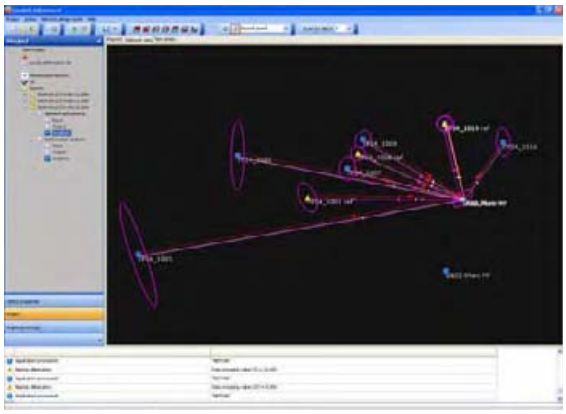
- The Leica GeoMoS Web service can be cancelled with a month's notice for the next billing period.
- The cancellation notice must be given in written form.

Customer Care Package License

Leica GeoMoS Web is a service that requires no extra CCP License.

1.6 GeoMoS Adjustment (772 767)

Leica GeoMoS Adjustment is an add-on analysis software that can be used to compute network adjustment and deformation analysis data collected by any GeoMoS Monitor.



- Manual and automatic import of GeoMoS XML files
- Network adjustment computation as minimal constraint network, reference points as fixed or absolute fixed
- Automatic outlier detection and removal
- Deformation analysis based on the two-step method
- Detect stable and unstable reference points
- Combination of total stations and/or GPS/GNSS
- Numerical and graphical analysis of the network adjustment and deformation analysis data
- Statistically qualified data with precision and reliability
- Display the magnitude, precision pattern and statistically significance of movements
- Display unstable reference points
- Compare the results of different measurement epochs
- Simulate the mathematical geometry simulation to optimize the network accuracy and reliability

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Extended Analysis Service
Consultation, training and data analysis services are available from our partner company Technet GmbH. Technet's highly qualified engineers have over 15 years of experience in high precision deformation surveys, network adjustment and deformation analysis in a wide range of projects.

Notes:

- GeoMoS Monitor Option 3 (773 056) is required to export data for GeoMoS Adjustment. The GeoMoS Monitor Option 3 bit must be available on the dongle where GeoMoS Monitor is running.
- GeoMoS Demo (724 933) does not include Leica GeoMoS Adjustment

1.7 Leica CrossCheck

Leica CrossCheck is a web based service for GPS/GNSS reference network coordinate calculation, integrity monitoring and deformation monitoring.

Monitoring Service
The Monitoring Service provides detection and warning of antenna movements in near real time for networks of GNSS reference stations or monitoring receivers. Site coordinates are calculated at a user defined interval. The solution is tailored to the needs of the customers network/project, including the processing interval, processing strategy, coordinate datum, limit checks and content of the secure online web service. An email messaging service is offered to provide warning when a significant movement occurs.

The Monitoring Service consists of a one-time setup fee and then a quarterly subscription comprised of a base fee and a per site fee.

Leica GeoMoS CrossCheck for monitoring		
5 002 094	CrossCheck Monitoring Setup Fee	For the initial configuration of the service. Once only.
5 302 771	CrossCheck Quarterly Subscription Base Fee	For access to the web service for a period of three months (90 days). One article is required for each web service.
5 302 772	CrossCheck Quarterly Subscription Per Site	For access to the web service for a period of three months (90 days). One article is required for each monitoring receiver.

Invoicing

- The initial setup fee will be invoiced after sending the entitlement number (see below)
- The Single Computation Service will be invoiced once the service has been completed
- The Monitoring Service will be invoiced quarterly at the end of the period, if not cancelled (see below)

Monitoring Service Change Requests

The amount of Quarterly Subscription Per Site of the Leica CrossCheck Monitoring Service can be changed at a month's notice for the next billing period. An administration fee (Article 5 002 120) is incurred each time the number of points is increased or decreased.

Cancellation

- The Leica CrossCheck Monitoring Service can be cancelled with a month's notice for the next quarter.
- The cancellation notice must be given in written form.

GeoMoS Maintenance

2.1 Customer Care Packages (CCP)

A powerful and competent worldwide service and support network backs up Leica GeoMoS.

- Leica GeoMoS Monitor
- Leica GeoMoS Analyzer
- Leica GeoMoS Adjustment

Customer Care Packages (CCPs) provide you access to a world-class support & service infrastructure and ensure your systems are being kept up to date.

A wide selection of comprehensive Customer Care Packages is available bundling Hardware Maintenance, Software Maintenance, Customer Support and Extended Warranty. For more information about the CCP offering in your country please contact your local Leica Geosystems organization or distribution partner.

The Customer Care Packages articles are available worldwide and can be ordered for end-users together with new software.

Select CCP

6000933	1 year GeoMoS Basic CCP
6000934	2 year GeoMoS Basic CCP
6000935	3 year GeoMoS Basic CCP

Select CCP for Distribution Partner

6000936	1 year GeoMoS Distr. Basic CCP
6000937	2 year GeoMoS Distr. Basic CCP
6000938	3 year GeoMoS Distr. Basic CCP

2.2 Other Services

The following services are available on request at daily rates.

Training at customer site
Installation support
Customizing

Information on article numbers are available on request.

Monitoring systems

3.1 Overview

Each monitoring project has specific measurement and accuracy requirements. If you are going to prepare a monitoring project or plan to offer a quotation for a monitoring tender, the following five sections have to considered:

1. Sensors	▪ Total stations, prisms and mounting ▪ GNSS Sensors, antennas and mounting ▪ Inclination Sensors, shelters and mounting ▪ Meteo Sensors, mounting ▪ Other Sensors
2. PC and Software	Robust PC with serial ports and GeoMoS, GeoMoS Web, GNSS Spider or GNSS QC.
3. Power	Reliable power source with backup ▪ direct power or ▪ separate units or ▪ solar panels
4. Communication	Cables, radio modems
5. Miscellaneous	▪ Measurement hut to protect the total station and PC from the elements for example rain, sun, dust, snow ▪ Pillars and monumentation ▪ Climate control system (avoid temperature expansion, moisture, condensation and uneven heating of the instrument) ▪ Security ▪ Access (physical and remote)

Combine Leica software, geodetic, geotechnical and meteorological sensors to match the needs of your monitoring challenge. Basic examples are given in the next section to provide an idea of monitoring setups and options.

3.2 Setup of a Total Station with direct serial 15

3.3 Remote Setup of a Total Station with Radio (GFU14) 16

3.4 Remote Setup of a Total Station with Radio (TCPS27) 18

3.5 Setup of a MC75 19

3.6 Setup of real-time GNSS with GMX902 Sensors 20

3.7 Setup of post processing GNSS with GRX1200Pro Sensors 22

3.8 Setup of a Meteo Sensor 24

3.9 Setup of a Level 25

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3.11 Setup of a GNSS Sensor co-located with a Total Station 28

3.12 Setup of a GMX901 Sensor with standard cables 30

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3.14 Remote Setup of a GMX901 Sensor with Radio (GFU-14) 32

3.15 Setup of a Nivel210 (RS232) 34

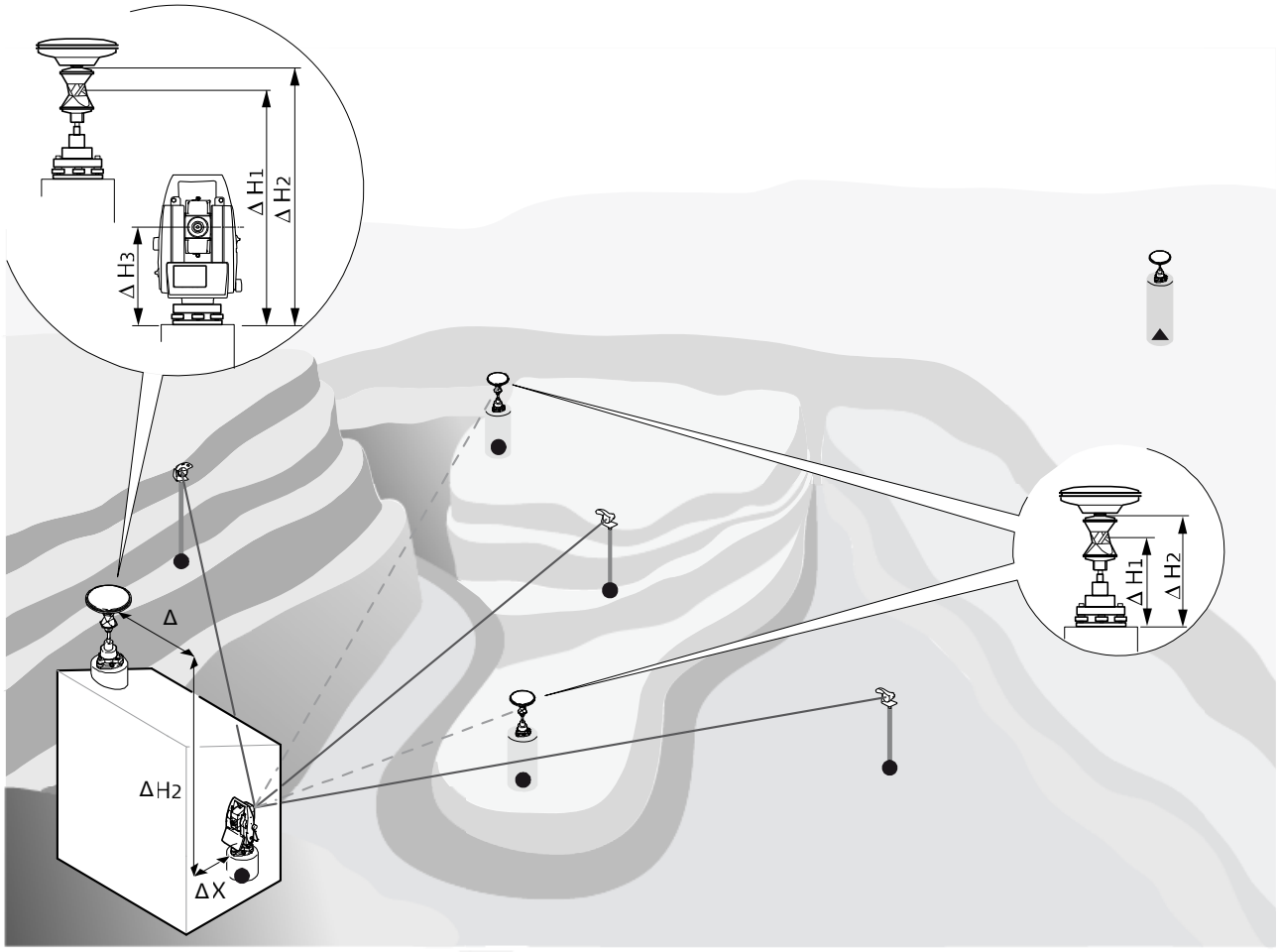
3.16 Setup of a Nivel210 with GRX1200Pro Series 35

3.17 Setup of a Nivel220 (RS485) with Leica cables 37

3.18 Setup of a Nivel220 (RS485) with long cables 38

GeoMoS is an integrated solution that supports total station, GNSS receivers, levels and geotechnical sensors for an overall understanding of structural movements.

In large monitoring projects total stations and GNSS receivers can be combined in many different ways to match the requirements and use a stable reference. The diagram below shows various possibilities.



Legend		
	▲	Stable reference point
	●	Unstable monitoring point
	Δ H, Δ X, Δ Y	Offsets to be set in GeoMoS

Total station with co-located GNSS sensor

- A GNSS antenna can be mounted on the top of the measurement hut and applied to the total station stand point with a three-dimensional offset.
- To orientate the system, a GNSS antenna inside the unstable area is used to update the reference point.
- The GNSS antenna needs a reference station so that baselines can be computed.

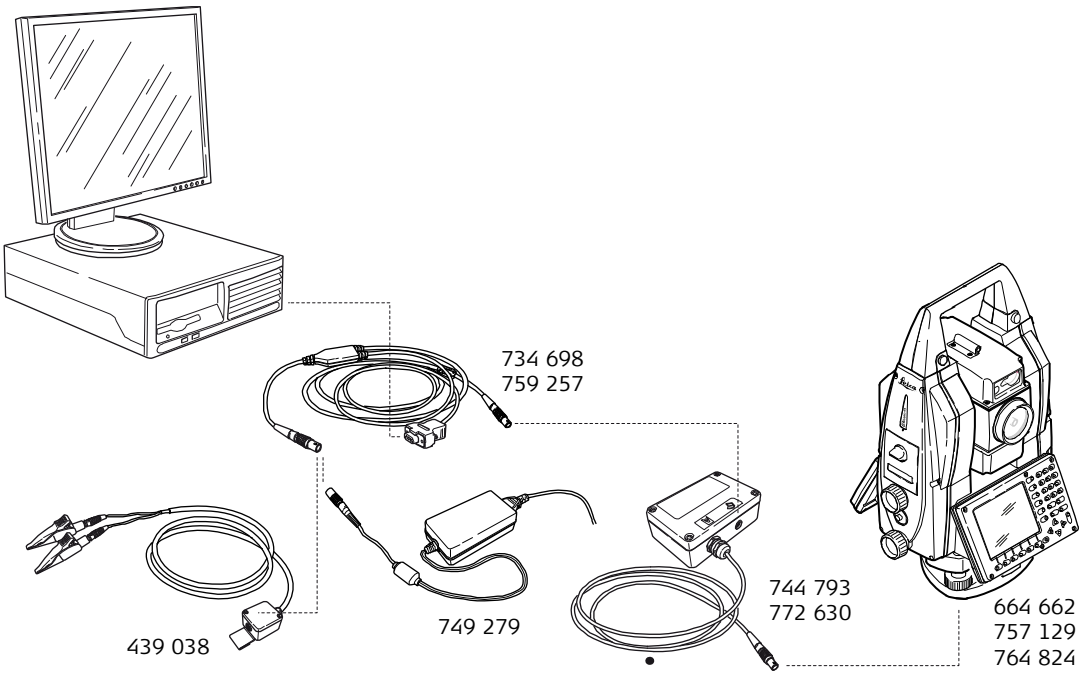
Reference points with co-located GNSS sensors

- A total station stand point can be measured and calculated with a free station or distance intersection to reference points inside the unstable area.
- A GNSS antenna can be mounted on the top of the prism and applied to the point with a height offset.
- The GNSS antenna needs a reference station so that baselines can be computed.

Reference station

- A GNSS antenna can be mounted in a stable area as a reference station. The reference station should be as close as possible (< 3km) to the monitoring area so that the baselines can be computed with the highest accuracy.

3.2 Setup of a Total Station with direct serial



Select Total Station

664 662	**TCA2003, 0.5"**(0.15mgon) automatic precision total station, with laser plummet, 2 control panels, accessories, user manual and container.
757 129	**TM30 0.5"**, 0.15gon, total station with reflectorless EDM (R1000), automatic target recognition, communication sidecover, internal memory, laser plummet, 1 keyboard, standard applications, user manuals, and upright container.
764 824	**TM30 1"**, 0.3gon, total station with reflectorless EDM (R1000), automatic target recognition, communication sidecover, internal memory, laser plummet, 1 keyboard, standard applications, user manuals, and upright container.

Select Cables and Switchbox

744 793	Switchbox with cable 2.0m for TPS/1000/1100/1200 and GeoMoS. Supports cold boot for TPS (important 24/7 hours/day monitoring).
772 630	GDZ 68, Switchbox with a 2.0m cable for TM30/TS30 (Lemo 1) and GeoMoS. Supports cold boot for TPS (important 24/7 hours/day monitoring).
734 698	GEV187, Y-cable, connects TPS/1000/1100/1200 to PC (9-pin RS232 serial) and external battery, 2.0m.
759 257	GEV220, Y-cable, connects TM30/TS30 to PC (9-pin RS232 serial) and external battery, 2.0m.

Select Power

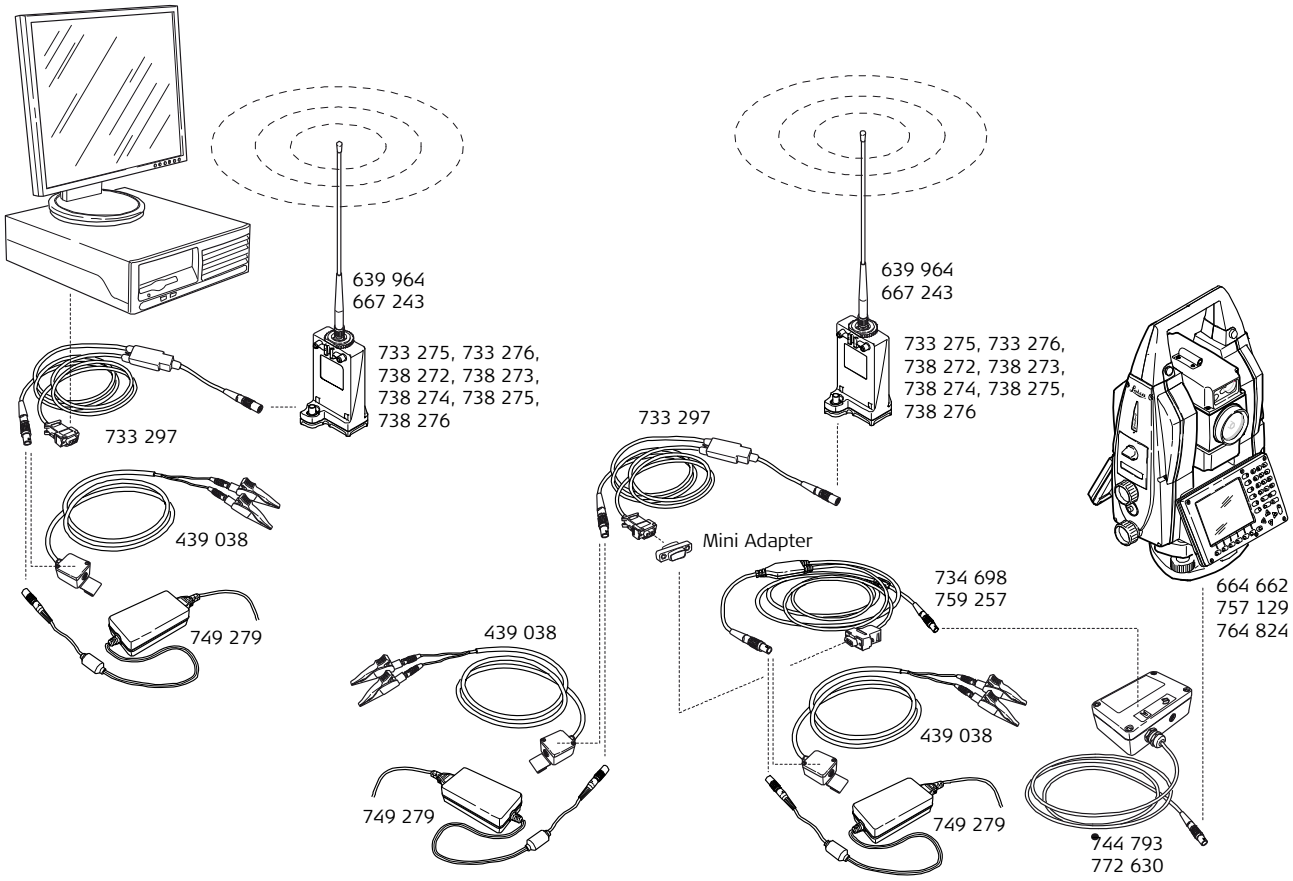
439 038	GEV71, 4m car battery cable, connects TPS or GPS receiver to 12V car battery.
749 279	GEV208, Power supply unit for TPS, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to TPS.

Select power cords for 12V power supply unit 749 279. Refer to "5 Power supply".

Select Software

GeoMoS Monitor / Analyzer	Refer to "1 GeoMoS Modules"

3.3 Remote Setup of a Total Station with Radio (GFU14)



Select Total Station

664 662	**TCA2003, 0.5"**(0.15mgon) automatic precision total station, with laser plummet, 2 control panels, accessories, user manual and container.
757 129	**TM30 0.5"**, 0.15gon, total station with reflectorless EDM (R1000), automatic target recognition, communication sidecover, internal memory, laser plummet, 1 keyboard, standard applications, user manuals, and upright container.
764 824	**TM30 1"**, 0.3gon, total station with reflectorless EDM (R1000), automatic target recognition, communication sidecover, internal memory, laser plummet, 1 keyboard, standard applications, user manuals, and upright container.

Select Cables and Switchbox

744 793	Switchbox with cable 2.0m for TPS/1000/1100/1200 and GeoMoS. Supports cold boot for TPS (important 24/7 hours/day monitoring)
772 630	GDZ 68, Switchbox with a 2.0m cable for TM30/TS30 (Lemo 1) and GeoMoS. Supports cold boot for TPS (important 24/7 hours/day monitoring).
734 698	GEV187, Y-cable, connects TPS/1000/1100/1200 to PC (9-pin RS232 serial) and external battery, 2.0m.
759 257	GEV220, Y-cable, connects TM30/TS30 to PC (9-pin RS232 serial) and external battery, 2.0m.
733 297	GEV171, 1.8m cable to program, the Satelline 3AS radio modem inside the GFU14 housing.
Mini adapter	Null modem, DB9 male to DB9 male. Refer to "9.7.2 Mini adapter".

Select Radio Modem

733 275	GFU14-0, Satelline 3AS radio modem (433.525 MHz, 25.0 kHz channel spacing, 0.5 W)
733 276	GFU14-1, Satelline 3AS radio modem (406.425 MHz, 25.0 kHz channel spacing, 1.0 W)
738 272	GFU14-2, Satelline 3AS radio modem (445.000 MHz, 12.5 kHz channel spacing, 1.0 W)
738 273	GFU14-3, Satelline 3AS radio modem (443.000 MHz, 12.5 kHz channel spacing, 1.0 W)
738 274	GFU14-4, Satelline 3AS radio modem (440.550 MHz, 25.0 kHz channel spacing, 0.5 W)
738 275	GFU14-5, Satelline 3AS radio modem (458.150 MHz, 12.5 kHz channel spacing, 0.5 W)
738 276	GFU14-6, Satelline 3AS radio modem (439.8625 MHz, 12.5 kHz channel spacing, 1.0 W)

Select Radio Antenna

639 964	GAT1, Gainflex radio antenna, frequency range 400-435MHz.
667 243	GAT2, Gainflex radio antenna, frequency range 435-470MHz.

Select Power

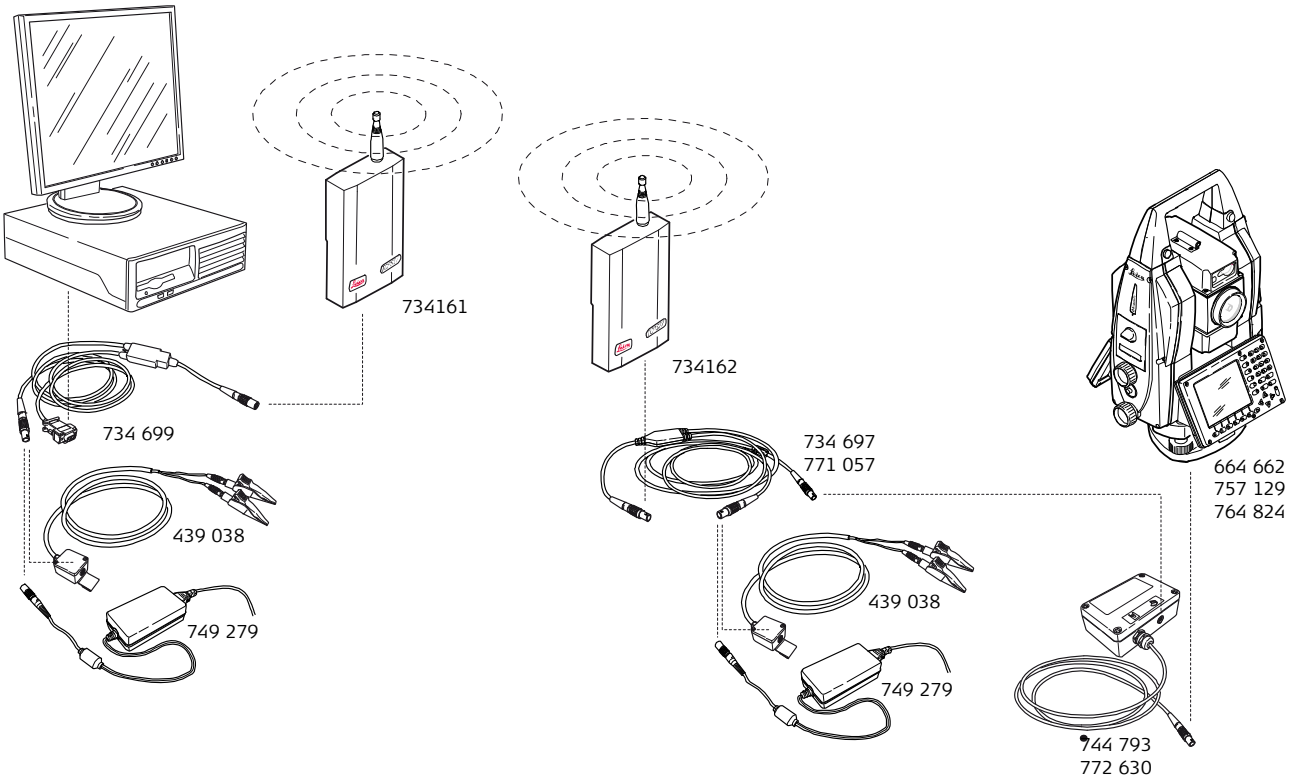
439 038	GEV71, 4m car battery cable, connects TPS or GPS receiver to 12V car battery.
749 279	GEV208, Power supply unit for TPS, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to TPS.

Select power cords for 12V power supply unit 749 279. Refer to "5 Power supply".

Select Software

GeoMoS Monitor / Analyzer	Refer to "1 GeoMoS Modules"

3.4 Remote Setup of a Total Station with Radio (TCPS27)



Select Total Station

664 662	**TCA2003, 0.5"**(0.15mgon) automatic precision total station, with laser plummet, 2 control panels, accessories, user manual and container.
757 129	**TM30 0.5"**, 0.15gon, total station with reflectorless EDM (R1000), automatic target recognition, communication sidecover, internal memory, laser plummet, 1 keyboard, standard applications, user manuals, and upright container.
764 824	**TM30 1"**, 0.3gon, total station with reflectorless EDM (R1000), automatic target recognition, communication sidecover, internal memory, laser plummet, 1 keyboard, standard applications, user manuals, and upright container.

Select cables and switchbox

744 793	Switchbox with cable 2.0m for TPS/1000/1100/1200 and GeoMoS. Supports cold boot for TPS (important 24/7 hours/day monitoring)
772 630	GDZ 68, Switchbox with a 2.0m cable for TM30/TS30 (Lemo 1) and GeoMoS. Supports cold boot for TPS (important 24/7 hours/day monitoring).
734 697	GEV186, Y-cable, connects TCPS27 to TPS/1000/1100/1200 and external battery, 1.8m.
771 057	GEV236, Y-cable, connects TM30/TS30 to TCPS radio and external battery, 2m.
734 699	GEV188, Y-cable, connects TCPS27 to PC (9-pin RS232 serial) and external battery, 1.8m.

Select Radio Modem

734 161	TCPS27 B, radio modem (base), with antenna, user manual. Used as radio modem for TPS1200 (frequency range 2400 - 2483 Mhz).
734 162	TCPS27 R, radio modem (remote), with antenna, user manual. Used as external radio for PC (frequency range 2400 - 2483 MHz).

Select Power

439 038	GEV71, 4m car battery cable, connects TPS or GPS receiver to 12V car battery.
749 279	GEV208, Power supply unit for TPS, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to TPS.

Select power cords for 12V power supply unit 749 279. Refer to "5 Power supply".

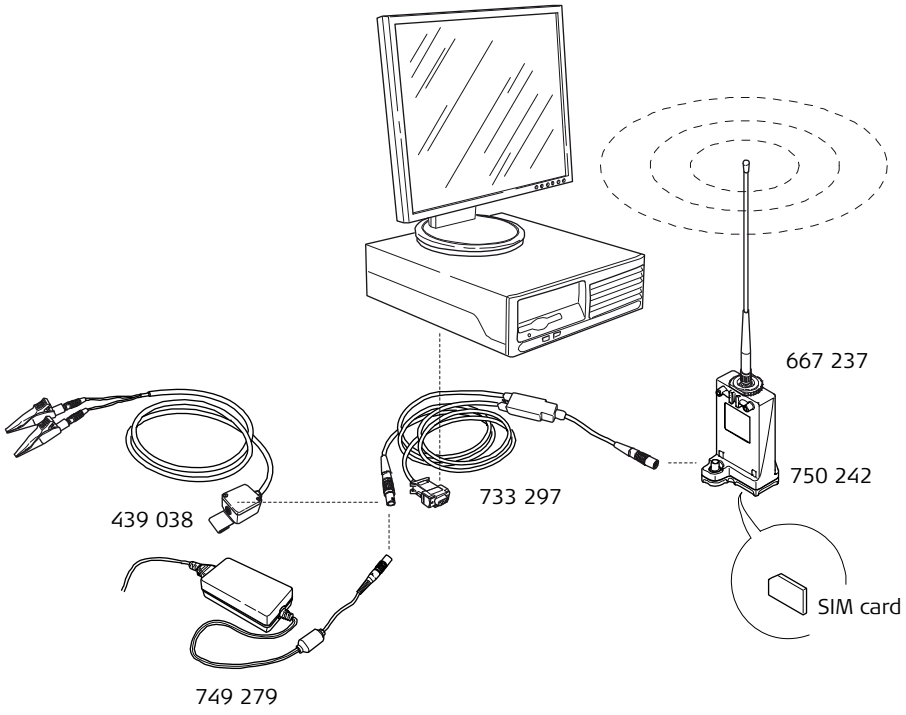
Select Software

GeoMoS Monitor / Analyzer Refer to "1 GeoMoS Modules"

Important:

- Use the **TCPS27 ConfigTool** from the CD to set the correct baud rate and link number.
- Enable the **RTS mode** in the GeoMoS Monitor software.

3.5 Setup of a MC75



750 242	GFU24, Housing with Siemens MC75 GSM/GPRS Module (Quad-Band GSM 850/900/1800/1900 MHz).
667 237	Antenna for 900/1800 MHz mobile network.
733 297	GEV171, 1.8m cable to program, the Satelline 3AS radio modem inside the GFU14 housing. Also used to connect GFU24 to PC.

Select Power

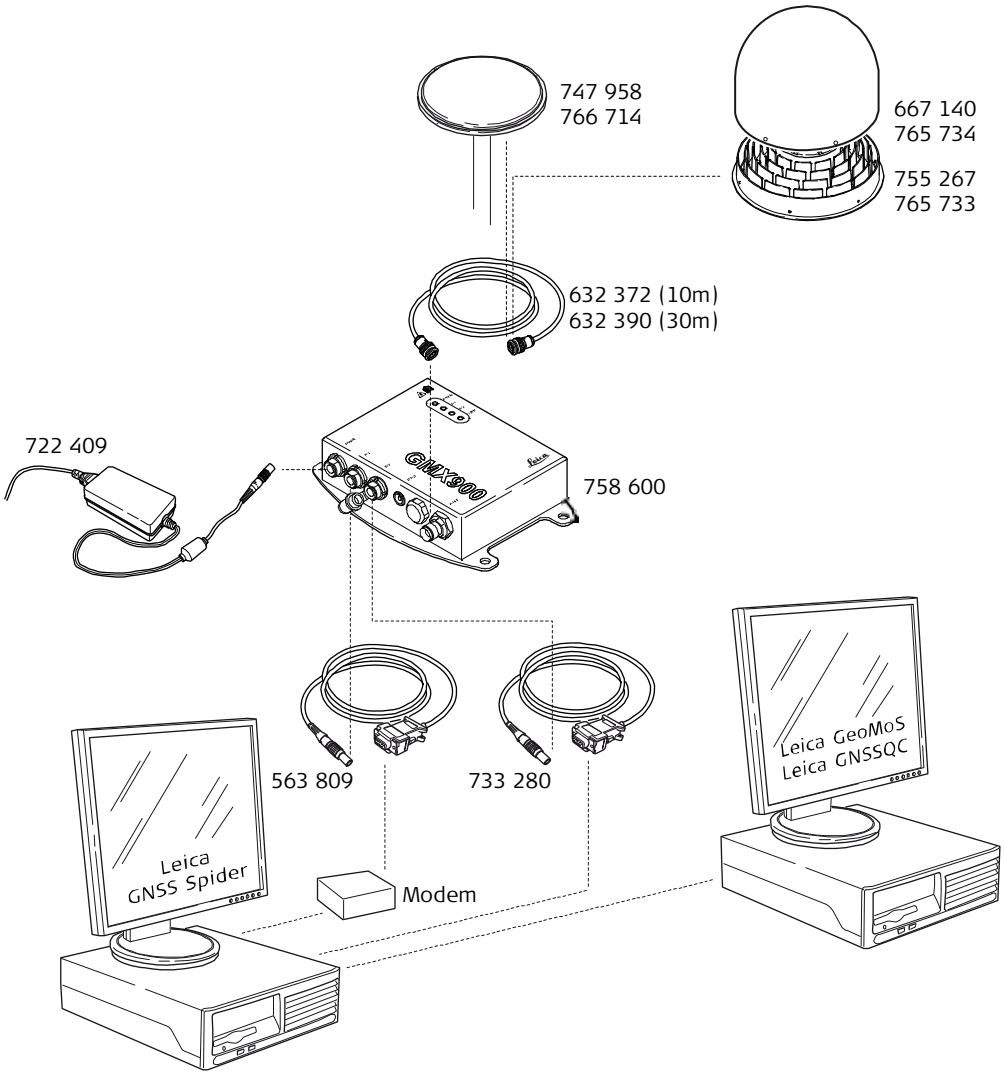
439 038	GEV71, 4m car battery cable, connects TPS or GPS receiver to 12V car battery.
749 279	GEV208, Power supply unit for TPS, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to TPS.

Select power cords for 12V power supply unit 749 279. Refer to "5 Power supply".

Select Software

GeoMoS Monitor / Analyzer	Refer to "1 GeoMoS Modules"

3.6 Setup of real-time GNSS with GMX902 Sensors



Select Receiver

758 600	GMX902 GG, GNSS Dual Frequency Receiver for Monitoring Applications.

Select Antenna

747 958	AX1203+ GNSS, GPS/GLONASS/Galileo Triple Frequency Antenna for all GRX1200 Series and GRX1200+ Series receivers.
766 714	AX1202 GG, Dual Frequency Antenna for GX1230 GG and GRX 1200 GG Pro Receiver
755 267	AT504 GG, GPS/GLONASS dual-frequency choke-ring antenna for GPS/GLONASS receivers. Dorne-Margolin antenna element, JPL design. Conforms to IGS "Typ T" specification for GPS antennas. For GX1220 / 1230, GRX1200 and GMX902 Receivers.
765 733	AR25, GNSS choke ring antenna for GPS/GLONASS/Galileo/Compass receivers. Includes L-Band signals. Dorne-Margolin antenna element.
667 140	GVP601, Weather-protection radome for AT504 choke ring antenna.
765 734	GVP653, Weather-protection radome AR25 choke ring antenna.

Select Antenna Cables

632 372	Antenna cable, 10 m
632 390	Antenna cable, 30 m

Select Power

722 409	Power supply unit for GPS receiver, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to GPS.

Select power cords for 12V power supply unit 722 409. Refer to "5 Power supply".

Select Communication between Sensors and Spider

733 280	GEV160, 2.8m Data transfer cable. Connects GPS1200 receiver Ports 1, 2 and 3, RX1220 or GMX902 to PC for data transfer, firmware upload etc. Lemo 8 Pin to 9 pin RS232 female serial connector.
563 809	GEV113, 2.8m Modem cable. Connects GPS receiver Ports 1, 2 and 3 to modem. Lemo 8 Pin to 9 Pin RS232 male serial connector.

Select Software

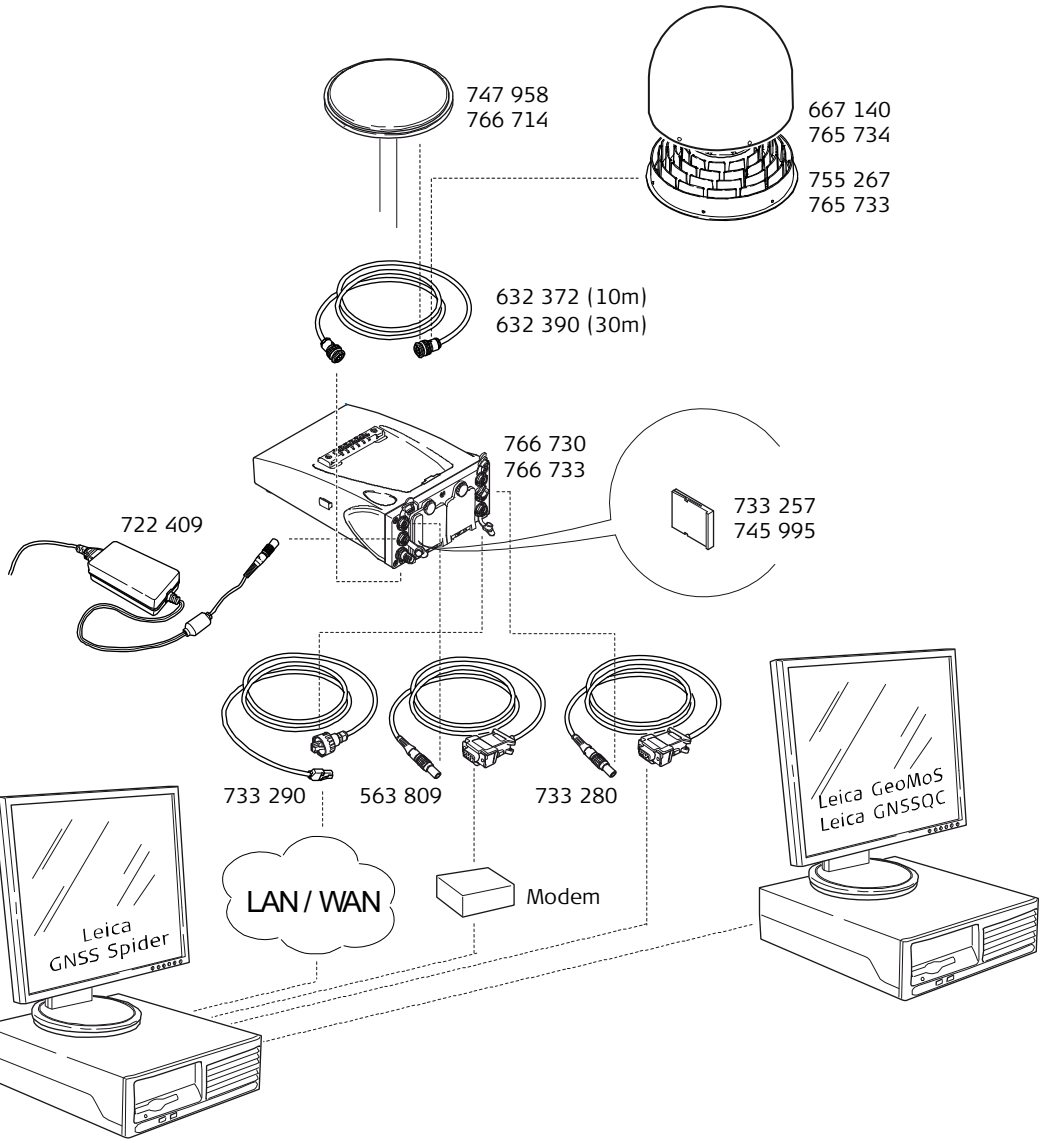
Leica GNSS Spider	Refer to "4.2.4 GNSS Spider"

Optional Software

GeoMoS Monitor / Analyzer	Refer to "1 GeoMoS Modules"
Leica GNSS QC	Refer to "4.2.5 GNSS QC"

Note: If you connect more than one GNSS receiver to GeoMoS to use for monitoring we recommend GNSS connection to the Leica Spider software. GeoMoS supports an interface to Leica GNSS Spider software (order GNSS Spider and accessories separately)

3.7 Setup of post processing GNSS with GRX1200Pro Sensors



Select Receiver

766 730	GRX1200+, Triple Frequency GPS Reference Station Receiver, Professional, with Event Input, PPS Output, External Oscillator Input and Ethernet connectivity. Includes L2C.
766 733	GRX1200+, GPS/GLONASS/Galileo Triple Frequency Reference Station Receiver, Professional, with Event Input, PPS Output, External Oscillator Input and Ethernet connectivity. Includes L2C. Requires separate software options for full time GPS L5/GLONASS and Galileo.

Purchasable Options

For additional information see

745 972	Equipment list “For GNSS Networks and Reference Stations”

Select CompactFlash Card

733 257	MCF256, CompactFlash card 256MB.
745 995	MCF1000, CompactFlash card 1GB.

Select Antenna

747 958	AX1203+ GNSS, GPS/GLONASS/Galileo Triple Frequency Antenna for all GRX1200 Series and GRX1200+ Series receivers.
766 714	AX1202 GG, Dual Frequency Antenna for GX1230 GG and GRX 1200 GG Pro Receiver
755 267	AT504 GG, GPS/GLONASS dual-frequency choke-ring antenna for GPS/GLONASS receivers. Dorne-Margolin antenna element, JPL design. Conforms to IGS "Typ T" specification for GPS antennas. For GX1220 / 1230, GRX1200 and GMX902 Receivers.

765 733 AR25, GNSS choke ring antenna for GPS/GLONASS/Galileo/Compass receivers. Includes L-Band signals. Dorne-Margolin antenna element.
667 140 GVP601, Weather-protection radome for AT504 choke ring antenna.
765 734 GVP653, Weather-protection radome AR25 choke ring antenna.

Select Antenna Cables

632 372 Antenna cable, 10 m
632 390 Antenna cable, 30 m

Select Power

722 409 Power supply unit for GPS receiver, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to GPS.

Select power cords for 12V power supply unit 722 409. Refer to "5 Power supply".

Select Communication between Sensors and Spider

733 280 GEV160, 2.8m Data transfer cable. Connects GPS1200 receiver Ports 1, 2 and 3, RX1220 or GMX902 to PC for data transfer, firmware upload etc. Lemo 8 Pin to 9 pin RS232 female serial connector.
563 809 GEV113, 2.8m Modem cable. Connects GPS receiver Ports 1, 2 and 3 to modem. Lemo 8 Pin to 9 Pin RS232 male serial connector.
733 290 GEV168, 5.0m cable, connecting GPS Receiver with Ethernet LAN / RJ45

Select Software

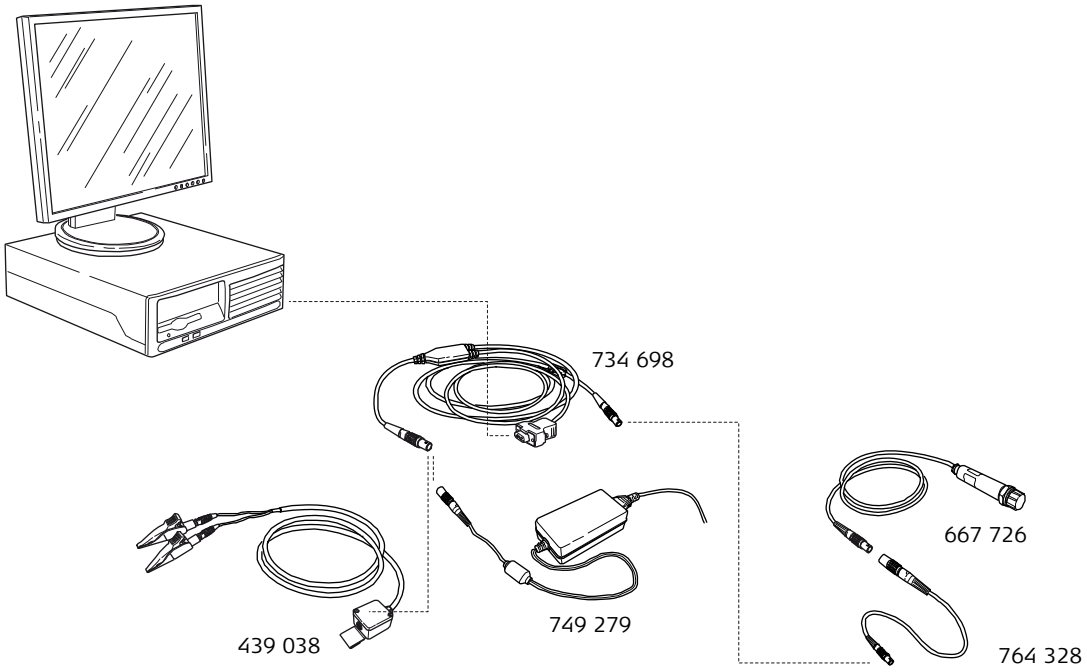
Leica GNSS Spider	Refer to "4.2.4 GNSS Spider"

Optional Software

GeoMoS Monitor / Analyzer	Refer to "1 GeoMoS Modules"
Leica GNSS QC	Refer to "4.2.5 GNSS QC"

Note: If you connect more than one GNSS receiver to GeoMoS to use for monitoring we recommend GNSS connection to the Leica Spider software. GeoMoS supports an interface to Leica GNSS Spider software (order GNSS Spider and accessories separately)

3.8 Setup of a Meteo Sensor



Select Sensor

667 726 DTM meteo sensor, combined pressure and temperature sensor 2m cable with Lemo1 plug. (other lengths of cable on request).

Select Sensor

734 698 GEV187, Y-cable, connects TPS to PC (9-pin RS232 serial) and external battery, 2.0m.
764 328 GEV222, Adapter cable DTM sensor, Lemo-1 (female) to Lemo-0 (female), 3.0m

Select Power

439 038 GEV71, 4m car battery cable, connects TPS or GPS receiver to 12V car battery.
749 279 GEV208, Power supply unit for TPS, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to TPS.

Select power cords for 12V power supply unit 749 279. Refer to "5 Power supply".

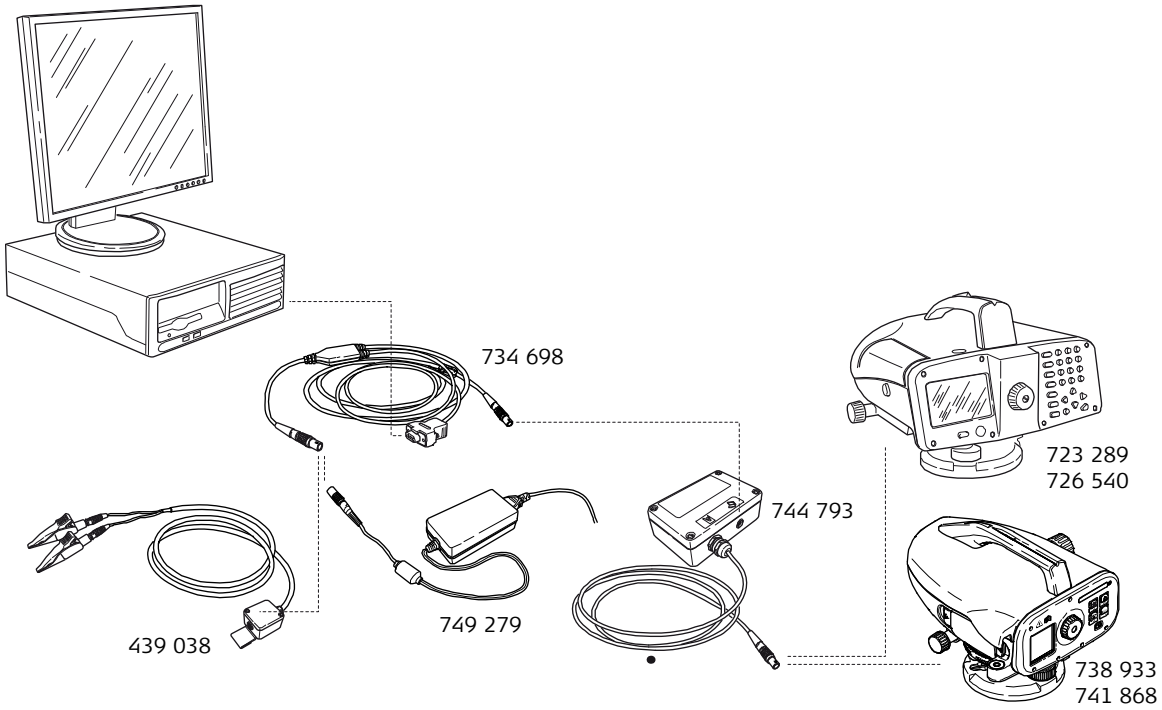
Select Software

GeoMoS Monitor / Analyzer Refer to "1 GeoMoS Modules"

Important:

- Remove the yellow transportation cover for monitoring
- The DTM meteo sensor should be mounted upside down

3.9 Setup of a Level



Select Level

723 289	DNA03, 0.3mm, precision digital level, magnetically-damped compensator, with user manual and container.
726 540	DNA10, 0.9mm, digital level, magnetically-damped compensator, with user manual and container.
738 933	SPRINTER 100M, 2.0mm, electronic level, with RS232 interface & internal memory, with user manual, 4 pcs AA dry cells and container.
741 868	SPRINTER 200M, 1.5mm, electronic level, with RS232 interface & internal memory, with user manual, 4 pcs AA dry cells and container.

Select Cables and Switchbox

744 793	Switchbox with cable 2.0m for TPS/1000/1100/1200 and GeoMoS. Supports cold boot for TPS (important 24/7 hours/day monitoring)
734 698	GEV187, Y-cable, connects TPS to PC (9-pin RS232 serial) and external battery, 2.0m.

Select Power

439 038	GEV71, 4m car battery cable, connects TPS or GPS receiver to 12V car battery.
749 279	GEV208, Power supply unit for TPS, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to TPS.

Select power cords for 12V power supply unit 749 279. Refer to "5 Power supply".

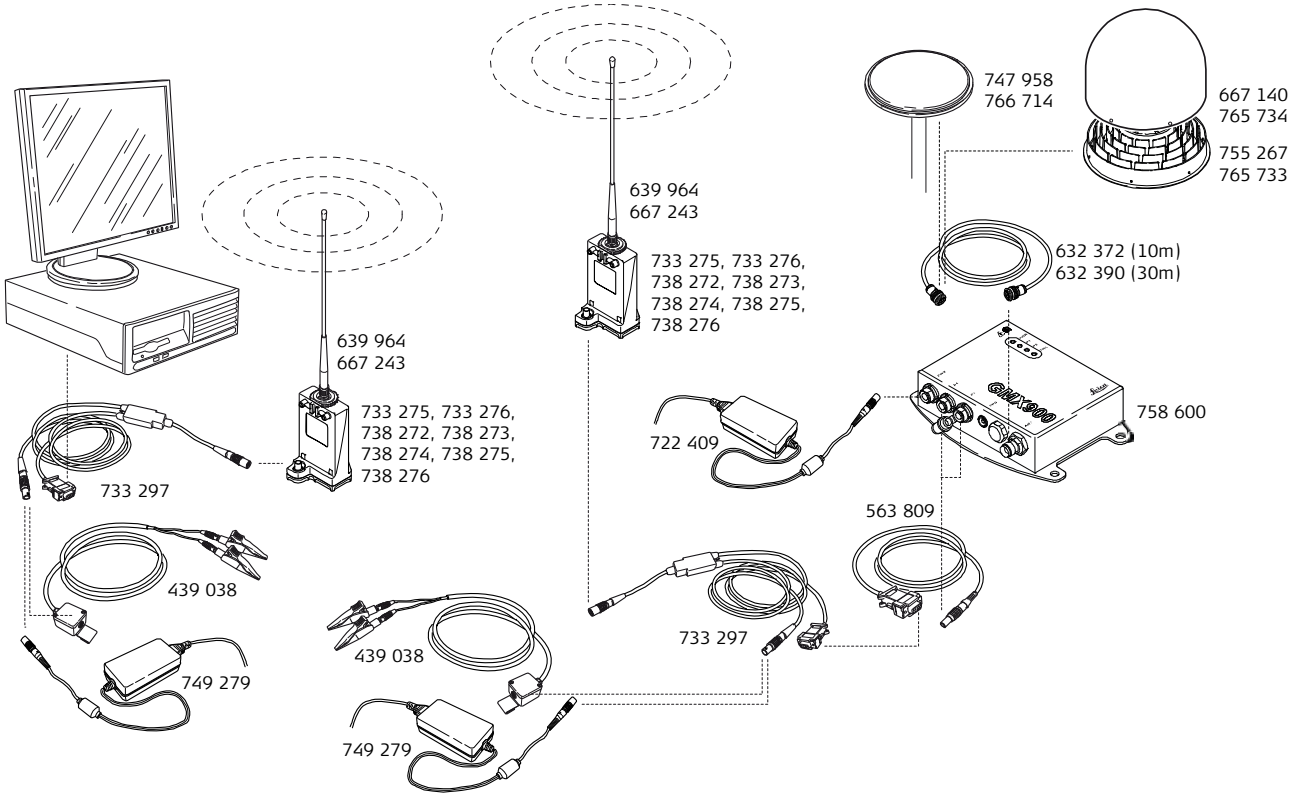
Select Staff

Refer to "4.3.2 DNA Staffs" and "4.3.3 Sprinter Staffs".

Select Software

GeoMoS Monitor / Analyzer	Refer to "1 GeoMoS Modules"

3.10 Remote Setup of a GMX902 Sensor with Radio (GFU-14)



Select Receiver

758 600	GMX902 GG, GNSS Dual Frequency Receiver for Monitoring Applications.

Select Antenna

747 958	AX1203+ GNSS, GPS/GLONASS/Galileo Triple Frequency Antenna for all GRX1200 Series and GRX1200+ Series receivers.
766 714	AX1202 GG, Dual Frequency Antenna for GX1230 GG and GRX 1200 GG Pro Receiver
755 267	AT504 GG, GPS/GLONASS dual-frequency choke-ring antenna for GPS/GLONASS receivers. Dorne-Margolin antenna element, JPL design. Conforms to IGS "Typ T" specification for GPS antennas. For GX1220 / 1230, GRX1200 and GMX902 Receivers.
765 733	AR25, GNSS choke ring antenna for GPS/GLONASS/Galileo/Compass receivers. Includes L-Band signals. Dorne-Margolin antenna element.
667 140	GVP601, Weather-protection radome for AT504 choke ring antenna.
765 734	GVP653, Weather-protection radome AR25 choke ring antenna.

Select Antenna Cables

632 372	Antenna cable, 10 m
632 390	Antenna cable, 30 m

Select Radio Modem

733 275	GFU14-0, Satelline 3AS radio modem (433.525 MHz, 25.0 kHz channel spacing, 0.5 W)
733 276	GFU14-1, Satelline 3AS radio modem (406.425 MHz, 25.0 kHz channel spacing, 1.0 W)
738 272	GFU14-2, Satelline 3AS radio modem (445.000 MHz, 12.5 kHz channel spacing, 1.0 W)
738 273	GFU14-3, Satelline 3AS radio modem (443.000 MHz, 12.5 kHz channel spacing, 1.0 W)
738 274	GFU14-4, Satelline 3AS radio modem (440.550 MHz, 25.0 kHz channel spacing, 0.5 W)
738 275	GFU14-5, Satelline 3AS radio modem (458.150 MHz, 12.5 kHz channel spacing, 0.5 W)
738 276	GFU14-6, Satelline 3AS radio modem (439.8625 MHz, 12.5 kHz channel spacing, 1.0 W)

Select Radio Antenna

639 964	GAT1, Gainflex radio antenna, frequency range 400-435MHz.
667 243	GAT2, Gainflex radio antenna, frequency range 435-470MHz.

Select Power

439 038	GEV71, 4m car battery cable, connects TPS or GPS receiver to 12V car battery.
749 279	GEV208, Power supply unit for TPS, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to TPS.
722 409	Power supply unit for GPS receiver, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to GPS.

Select power cords for 12V power supply unit 722 409 and 749 279. Refer to "5 Power supply".

Select Communication Cables

563 809	GEV113, 2.8m Modem cable. Connects GPS receiver Ports 1, 2 and 3 to modem. Lemo 8 Pin to 9 Pin RS232 male serial connector.
733 297	GEV171, 1.8m cable to program, the Satelline 3AS radio modem inside the GFU14 housing

Select Software

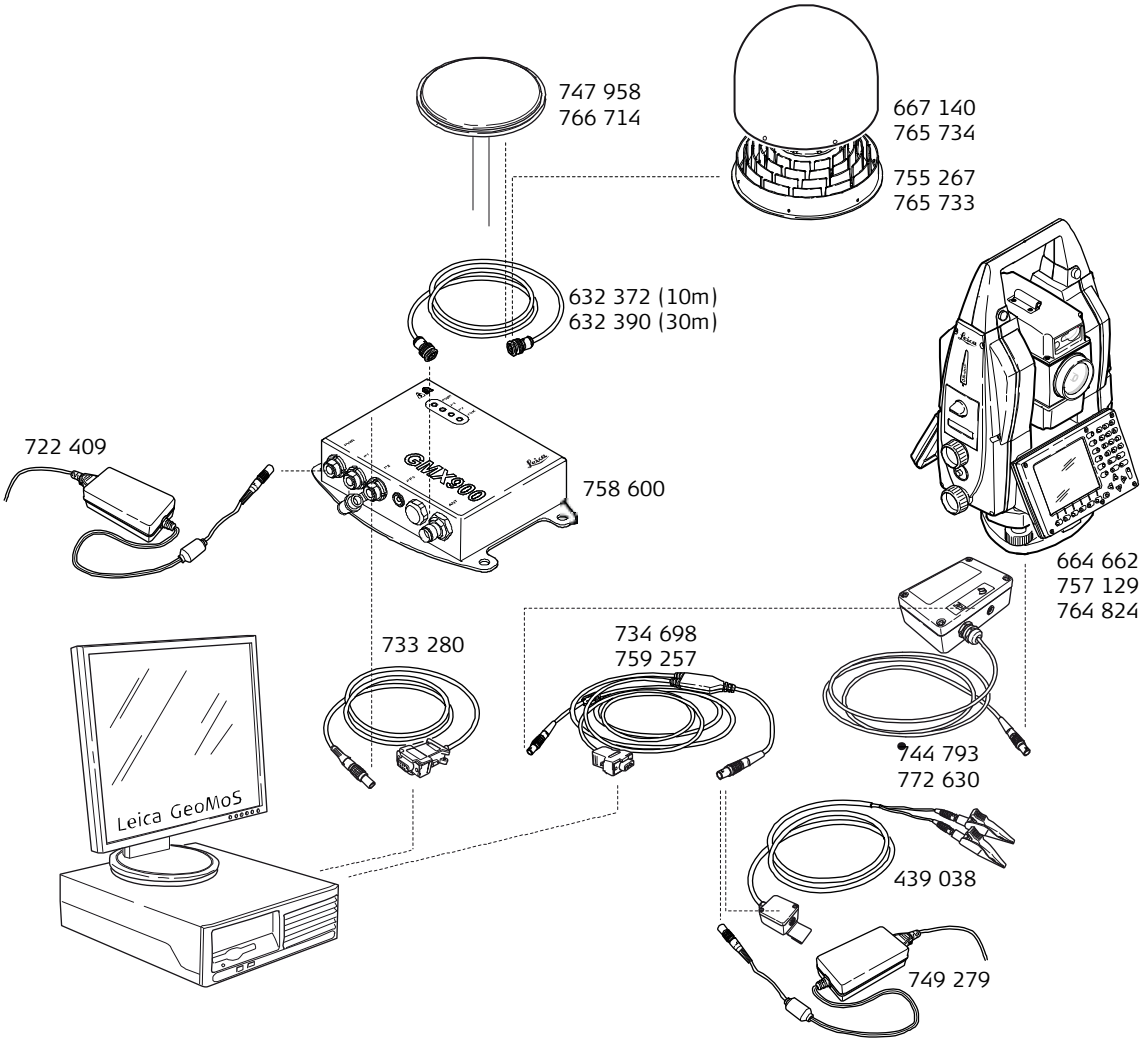
Leica GNSS Spider	Refer to "4.2.4 GNSS Spider"

Optional Software

GeoMoS Monitor / Analyzer	Refer to "1 GeoMoS Modules"
Leica GNSS QC	Refer to "4.2.5 GNSS QC"

Note: If you connect more than one GNSS receiver to GeoMoS to use for monitoring we recommend GNSS connection to the Leica Spider software. GeoMoS supports an interface to Leica GNSS Spider software (order GNSS Spider and accessories separately)

3.11 Setup of a GNSS Sensor co-located with a Total Station



Select Total Station

664 662 **TCA2003, 0.5"**(0.15mgon) automatic precision total station, with laser plummet, 2 control panels, accessories, user manual and container.

757 129 **TM30 0.5"**, 0.15gon, total station with reflectorless EDM (R1000), automatic target recognition, communication sidecover, internal memory, laser plummet, 1 keyboard, standard applications, user manuals, and upright container.

764 824 **TM30 1"**, 0.3gon, total station with reflectorless EDM (R1000), automatic target recognition, communication sidecover, internal memory, laser plummet, 1 keyboard, standard applications, user manuals, and upright container.

Select Cables and Switchbox

744 793 Switchbox with cable 2.0m for TPS/1000/1100/1200 and GeoMoS. Supports cold boot for TPS (important 24/7 hours/day monitoring)

772 630 GDZ 68, Switchbox with a 2.0m cable for TM30/TS30 (Lemo 1) and GeoMoS. Supports cold boot for TPS (important 24/7 hours/day monitoring).

734 698 GEV187, Y-cable, connects TPS/1000/1100/1200 to PC (9-pin RS232 serial) and external battery, 2.0m.

759 257 GEV220, Y-cable, connects TM30/TS30 to PC (9-pin RS232 serial) and external battery, 2.0m.

Select Receiver

758 600 GMX902 GG, GNSS Dual Frequency Receiver for Monitoring Applications.

Communication Cable

733 280 GEV160, 2.8m Data transfer cable. Connects GPS1200 receiver Ports 1, 2 and 3, RX1220 or GMX902 to PC for data transfer, firmware upload etc. Lemo 8 Pin to 9 pin RS232 female serial connector.

Select Antenna

747 958	AX1203+ GNSS, GPS/GLONASS/Galileo Triple Frequency Antenna for all GRX1200 Series and GRX1200+ Series receivers.
766 714	AX1202 GG, Dual Frequency Antenna for GX1230 GG and GRX 1200 GG Pro Receiver
755 267	AT504 GG, GPS/GLONASS dual-frequency choke-ring antenna for GPS/GLONASS receivers. Dorne-Margolin antenna element, JPL design. Conforms to IGS "Typ T" specification for GPS antennas. For GX1220 / 1230, GRX1200 and GMX902 Receivers.
765 733	AR25, GNSS choke ring antenna for GPS/GLONASS/Galileo/Compass receivers. Includes L-Band signals. Dorne-Margolin antenna element.
667 140	GVP601, Weather-protection radome for AT504 choke ring antenna.
765 734	GVP653, Weather-protection radome AR25 choke ring antenna.

Select Antenna Cables

632 372	Antenna cable, 10 m
632 390	Antenna cable, 30 m

Select Power

439 038	GEV71, 4m car battery cable, connects TPS or GPS receiver to 12V car battery.
749 279	GEV208, Power supply unit for TPS, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to TPS.
722 409	Power supply unit for GPS receiver, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to GPS.

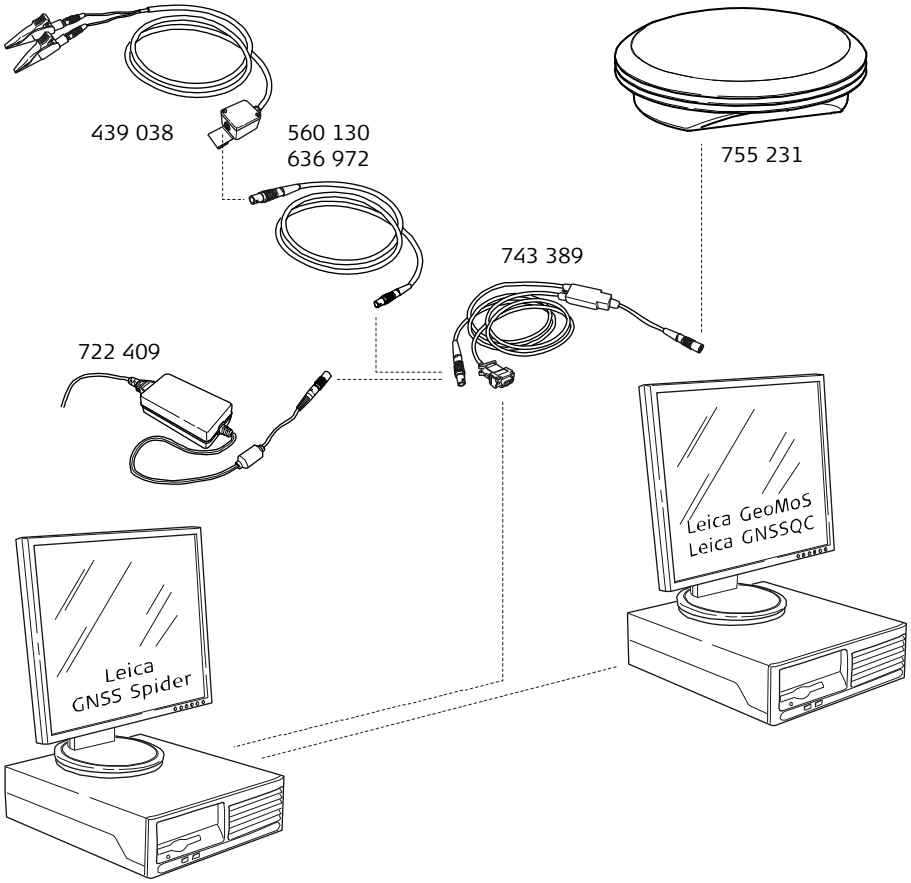
Select power cords for 12V power supply unit 722 409 and 749 279. Refer to "5 Power supply".

Select Software

GeoMoS Monitor / Analyzer	Refer to "1 GeoMoS Modules"
Leica GNSS Spider	Refer to "4.2.4 GNSS Spider"
Leica GNSS QC	Refer to "4.2.5 GNSS QC"

Note: If you connect more than one GNSS receiver to GeoMoS to use for monitoring we recommend GNSS connection to the Leica Spider software. GeoMoS supports an interface to Leica GNSS Spider software (order GNSS Spider and accessories separately)

3.12 Setup of a GMX901 Sensor with standard cables



Select Receiver

755 231 GMX901, GPS Smart Antenna for Monitoring Applications

Select Power

439 038 GEV71, 4m car battery cable, connects TPS or GPS receiver to 12V car battery.

722 409 Power supply unit for GPS receiver, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to GPS.

Select power cords for 12V power supply unit 722 409. Refer to "5 Power supply".

To connect battery, car battery or alternate power supply

560 130 1.8m cable, connects GEB171 external battery to GPS1200 receiver. Lemo-1, 5 pin, male to Lemo-1, 5 pin, male.

636 972 0.5m cable, connects GEB171 external battery to GPS1200 receiver. Lemo-1, 5 pin, male to Lemo-1, 5 pin, male.

Select Communication between Sensors and Spider

743 389 GEV197, Y-Cable, 2.8m, GMX901 to RS232 and external Leica power supply.

Select Software

Leica GNSS Spider — Refer to "4.2.4 GNSS Spider"

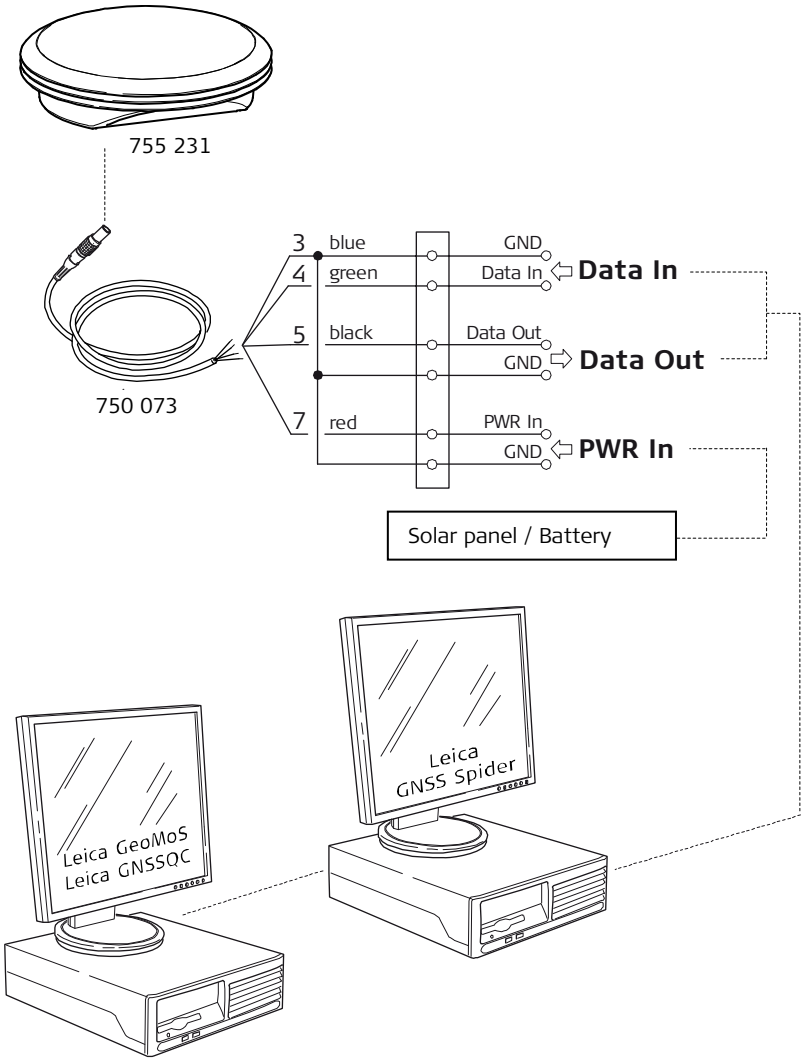
Optional Software

GeoMoS Monitor / Analyzer — Refer to "1 GeoMoS Modules"

Leica GNSS QC — Refer to "4.2.5 GNSS QC"

Note: If you connect more than one GNSS receiver to GeoMoS to use for monitoring we recommend GNSS connection to the Leica Spider software. GeoMoS supports an interface to Leica GNSS Spider software (order GNSS Spider and accessories separately)

3.13 Setup of a GMX901 Sensor with custom wired cables



Select Receiver

755 231 GMX901, GPS Smart Antenna for Monitoring Applications

Power / Communication

750 073 GEV212, Interface Cable, 5m, GMX901 to unterminated, connects GMX901 to a custom installation.

Select Software

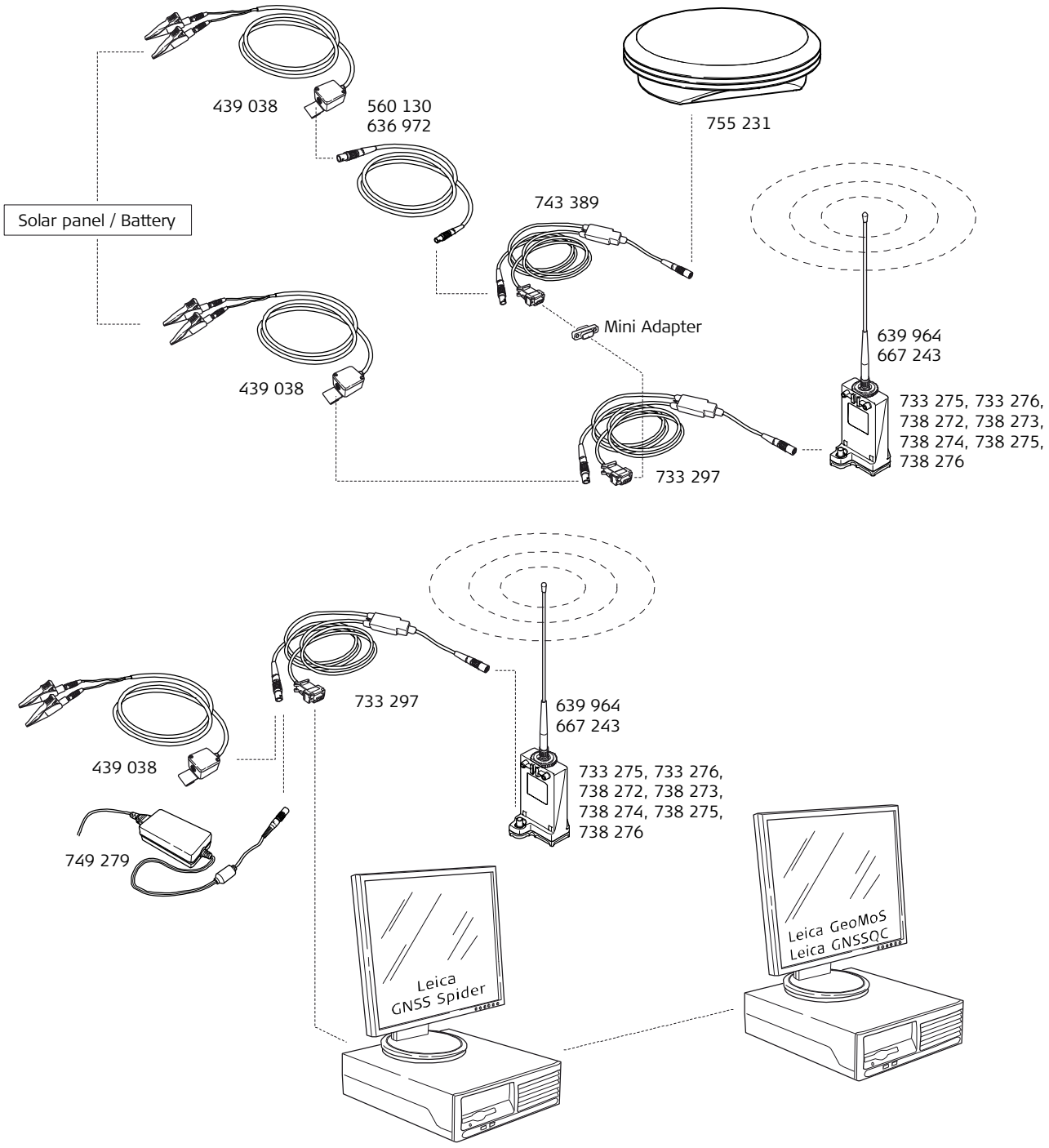
Leica GNSS Spider	Refer to "4.2.4 GNSS Spider"

Optional Software

GeoMoS Monitor / Analyzer	Refer to "1 GeoMoS Modules"
Leica GNSS QC	Refer to "4.2.5 GNSS QC"

Note: If you connect more than one GNSS receiver to GeoMoS to use for monitoring we recommend GNSS connection to the Leica Spider software. GeoMoS supports an interface to Leica GNSS Spider software (order GNSS Spider and accessories separately)

3.14 Remote Setup of a GMX901 Sensor with Radio (GFU-14)



Select Receiver

755 231	GMX901, GPS Smart Antenna for Monitoring Applications

Select Accessories

Mini adapter	Null modem, DB9 male to DB9 male. Refer to "9.7.2 Mini adapter".

Select Radio Modem

733 275	GFU14-0, Satelline 3AS radio modem (433.525 MHz, 25.0 kHz channel spacing, 0.5 W)
733 276	GFU14-1, Satelline 3AS radio modem (406.425 MHz, 25.0 kHz channel spacing, 1.0 W)
738 272	GFU14-2, Satelline 3AS radio modem (445.000 MHz, 12.5 kHz channel spacing, 1.0 W)
738 273	GFU14-3, Satelline 3AS radio modem (443.000 MHz, 12.5 kHz channel spacing, 1.0 W)
738 274	GFU14-4, Satelline 3AS radio modem (440.550 MHz, 25.0 kHz channel spacing, 0.5 W)

738 275	GFU14-5, Satelline 3AS radio modem (458.150 MHz, 12.5 kHz channel spacing, 0.5 W)
738 276	GFU14-6, Satelline 3AS radio modem (439.8625 MHz, 12.5 kHz channel spacing, 1.0 W)

Select Radio Antenna

639 964	GAT1, Gainflex radio antenna, frequency range 400-435MHz.
667 243	GAT2, Gainflex radio antenna, frequency range 435-470MHz.

Select Power

439 038	GEV71, 4m car battery cable, connects TPS or GPS receiver to 12V car battery.
749 279	GEV208, Power supply unit for TPS, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to TPS.
722 409	Power supply unit for GPS receiver, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to GPS.

Select power cords for 12V power supply unit 722 409 and 749 279. Refer to "5 Power supply".

To connect battery, car battery or alternate power supply

560 130	1.8m cable, connects GEB171 external battery to GPS1200 receiver. Lemo-1, 5 pin, male to Lemo-1, 5 pin, male.
636 972	0.5m cable, connects GEB171 external battery to GPS1200 receiver. Lemo-1, 5 pin, male to Lemo-1, 5 pin, male.

Select Communication Cables

733 297	GEV171, 1.8m cable to program, the Satelline 3AS radio modem inside the GFU14 housing
743 389	GEV197, Y-Cable, 2.8m, GMX901 to RS232 and external Leica power supply.

Select Software

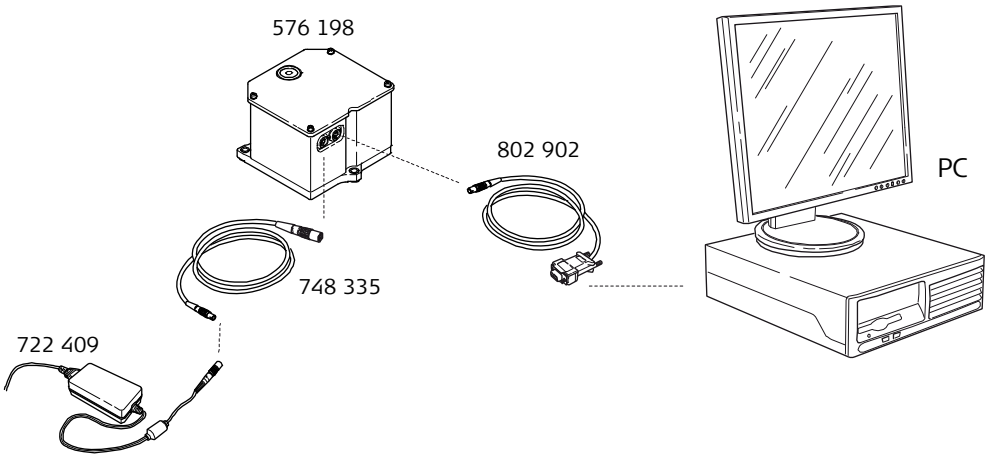
Leica GNSS Spider	Refer to "4.2.4 GNSS Spider"

Optional Software

GeoMoS Monitor / Analyzer	Refer to "1 GeoMoS Modules"
Leica GNSS QC	Refer to "4.2.5 GNSS QC"

Note: If you connect more than one GNSS receiver to GeoMoS to use for monitoring we recommend GNSS connection to the Leica Spider software. GeoMoS supports an interface to Leica GNSS Spider software (order GNSS Spider and accessories separately)

3.15 Setup of a Nivel210 (RS232)



Select Sensor

576 198	NIVEL210, inclination sensor with RS232 interface

Select Cables and Accessories

748 335	GEV204, Power supply-cab.f. NIVEL210/230
802 902	Cable, PC- NIVEL210, (Lemo-RS232), 1m
749 031	GHT59, Wall Mounting Kit for NIVEL200

Select Power

722 409	Power supply unit for GPS receiver, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to GPS.

Select power cords for 12V power supply unit 722 409. Refer to "5 Power supply".

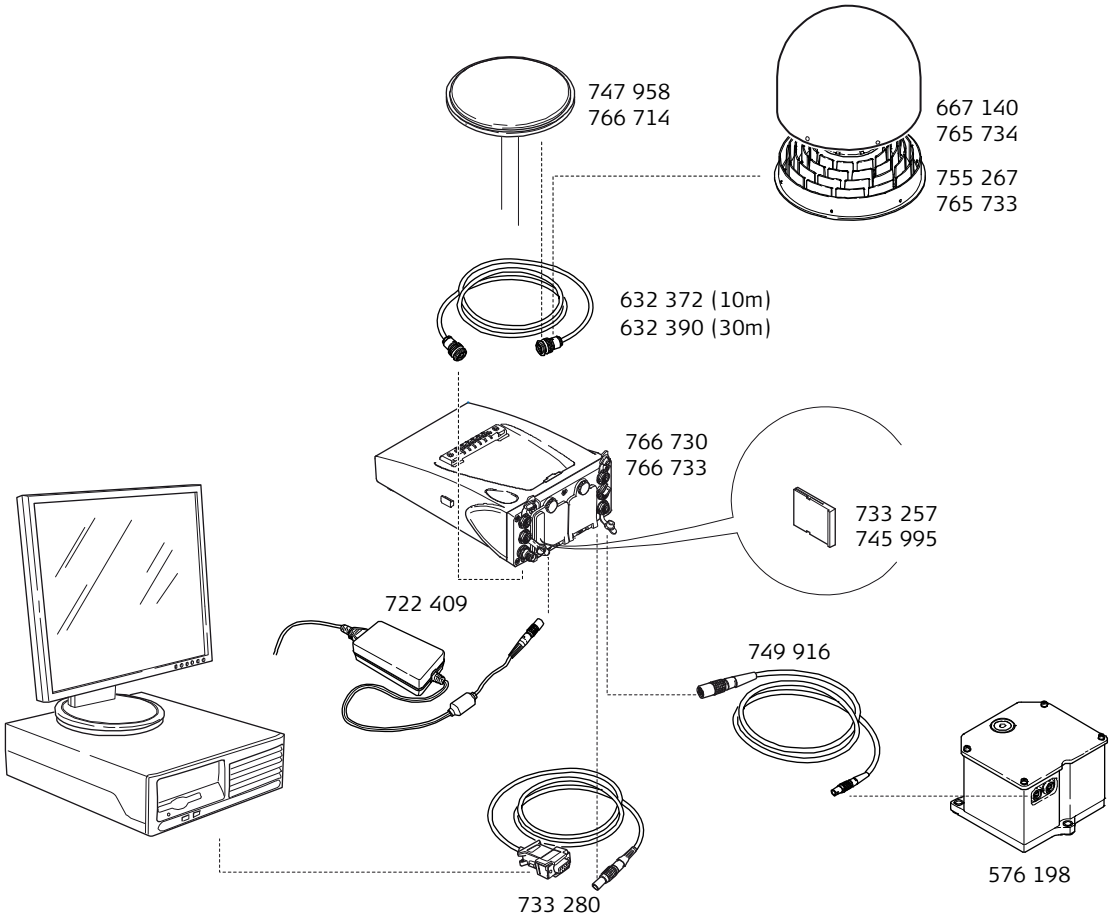
Select Software

GeoMoS Monitor / Analyzer	Refer to "1 GeoMoS Modules"
GNSS QC	Refer to "4.2.5 GNSS QC"

Important

- Use the **NivelTool** software from the CD to set the correct Nivel ID and baud rate.

3.16 Setup of a Nivel210 with GRX1200Pro Series



Select Sensor

576 198 NIVEL210, inclination sensor with RS232 interface

Select Cables and Accessories

749 916 GEV209, Cable, NIVEL210 - GPS1200, 1.8m

733 280 GEV160, 2.8m Data transfer cable. Connects GPS1200 receiver Ports 1, 2 and 3, RX1220 or GMX902 to PC for data transfer, firmware upload etc. Lemo 8 to 9 pin RS232 female serial connector.

749 031 GHT59, Wall Mounting Kit for NIVEL200

Select Receiver

766 730 GRX1200+, Triple Frequency GPS Reference Station Receiver, Professional, with Event Input, PPS Output, External Oscillator Input and Ethernet connectivity. Includes L2C.

766 733 GRX1200+, GPS/GLONASS/Galileo Triple Frequency Reference Station Receiver, Professional, with Event Input, PPS Output, External Oscillator Input and Ethernet connectivity. Includes L2C. Requires separate software options for full time GPS L5/GLONASS and Galileo.

Purchasable Options

For additional information see

745 972 Equipment list “For GNSS Networks and Reference Stations”

Select CompactFlash Card

733 257 MCF256, CompactFlash card 256MB.

745 995 MCF1000, CompactFlash card 1GB.

Select Antenna

747 958 AX1203+ GNSS, GPS/GLONASS/Galileo Triple Frequency Antenna for all GRX1200 Series and GRX1200+ Series receivers.

766 714 AX1202 GG, Dual Frequency Antenna for GX1230 GG and GRX 1200 GG Pro Receiver

755 267	AT504 GG, GPS/GLONASS dual-frequency choke-ring antenna for GPS/GLONASS receivers. Dorne-Margolin antenna element, JPL design. Conforms to IGS "Typ T" specification for GPS antennas. For GX1220 / 1230, GRX1200 and GMX902 Receivers.
765 733	AR25, GNSS choke ring antenna for GPS/GLONASS/Galileo/Compass receivers. Includes L-Band signals. Dorne-Margolin antenna element.
667 140	GVP601, Weather-protection radome for AT504 choke ring antenna.
765 734	GVP653, Weather-protection radome AR25 choke ring antenna.

Select Antenna Cables

632 372	Antenna cable, 10 m
632 390	Antenna cable, 30 m

Select Power

722 409	Power supply unit for GPS receiver, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to GPS.

Select power cords for 12V power supply unit 722 409. Refer to "5 Power supply".

Select Software

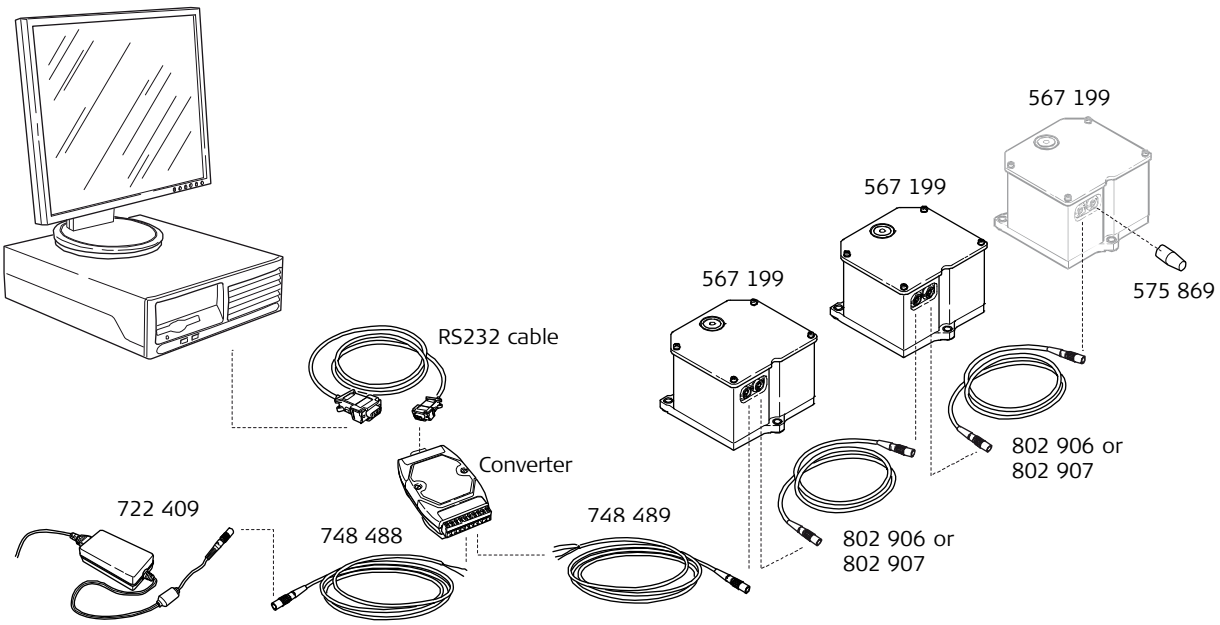
GRX onboard software

Important

- Use the **NivelTool** software from the CD to set the correct Nivel ID and baud rate.

3.17 Setup of a Nivel220 (RS485) with Leica cables

Cables supplied by Leica Geosystems



Select Sensor

576 199	NIVEL220, inclination sensor with R4852 interface

Select Cables and Accessories

748 488	0.8m power supply cable, connects power supply unit 722 409 to RS232/RS485 converter, Lemo-0 to 2 wires to terminal strip.
748 489	1.8m communication cable, connects Nivel220 to RS232/RS485 converter, Lemo-0 to 4 wires to terminal strip.
802 906	5.0m connection cable RS485. Connects two Nivel220 sensor ports 1 or 2, Lemo-0 to Lemo-0.
802 907	20.0m connection cable RS485. Connects two Nivel220 sensor ports 1 or 2, Lemo-0 to Lemo-0.
575 869	Terminator 120 Ohm, for RS485 Bus
RS232 cable	DB9 cable, DB9 male to DB9 female. Refer to "9.7.1 Cables".
Converter	RS232/RS485 converter. Refer to "9.1 RS232/RS485 converter".
749 031	GHT59, Wall Mounting Kit for NIVEL200

Select Power

722 409	Power supply unit for GPS receiver, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to GPS.

Select power cords for 12V power supply unit 722 409. Refer to "5 Power supply".

Select Software

GeoMoS Monitor / Analyzer	Refer to "1 GeoMoS Modules"
GNSS QC	Refer to "4.2.5 GNSS QC"

Important

- Use the **NivelTool** software from the CD to set the correct Nivel ID and baud rate.

3.18 Setup of a Nivel220 (RS485) with long cables

Cables supplied by Leica Geosystems and CAT cables

General information

- For the installation of the cables of the Nivel220 sensors, the general rules for the installation of electrical wiring apply.
- Avoid sharp bends and lay the cable in large loops within the range of rotating or moving parts.
- When installing the cables, please observe the already existing installation of electric system.
- After having completed the installation, please drive through all possible positions in order to make sure that the cables are not touching, stretched or even squeezed by any moving parts.

Please consider that a well-planned and thoroughly carried out electric installation does not only protect the cables against damages, but also looks professional.

Sensor auxiliary supply

Power for the Nivel220 sensor must be supplied externally. The power is connected to the sensor using a LEMO cable.

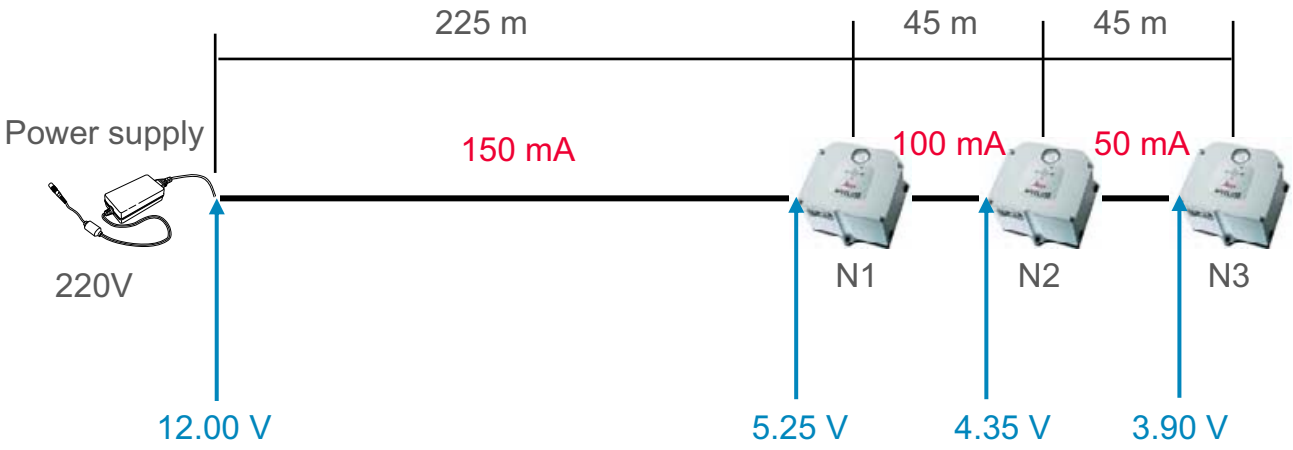
The auxiliary supply voltage at the Nivel220 sensor must be within the permissible range. Refer to "Nivel 200 User Manual". The correct operation of the sensor cannot be guaranteed when the supply voltage is not within this range and it can be damaged by overvoltages. For the voltage drop along long supply cables take into account and, if necessary, correspondingly increase the voltage at the supply end. The voltage drop is given by the following equation:

voltage drop [V] = resistance per m [Ω/m] * 2 * cable length [m] * current [A]

It can be assumed that the voltage drop is varying should the current through the sensor appear to fluctuate. A Nivel220 requires typically 50mA. Refer to "Nivel 200 User Manual".

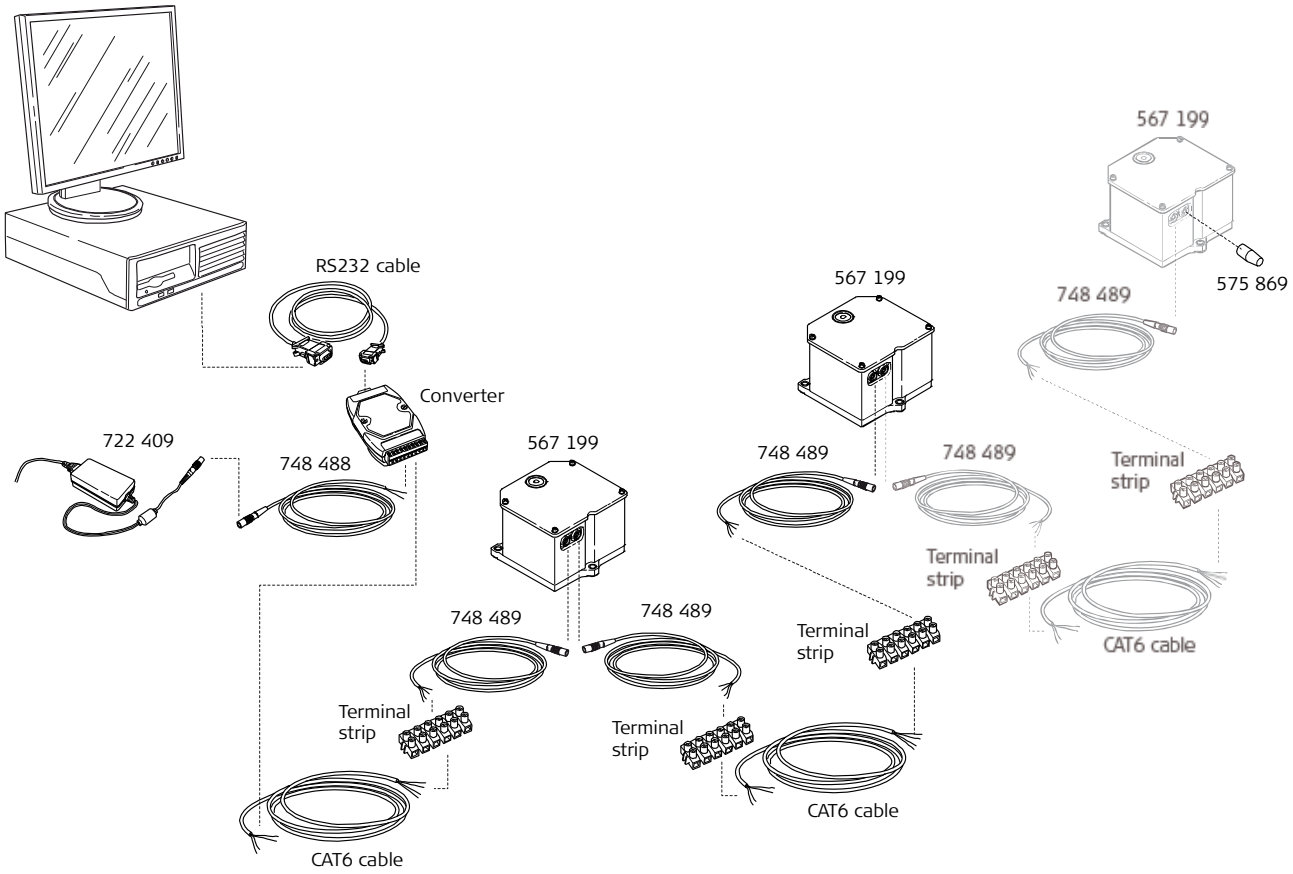
Use the Leica Geosystems power supply recommended by Leica Geosystems to ensure the correct functionality of the Nivel220 sensor.

Voltage drop computation



voltage drop [V] = 0.1 [Ω/m] * 2 * 225 [m] * 0.15 [A] = 6.75 [V]
voltage drop [V] = 0.1 [Ω/m] * 2 * 45 [m] * 0.10 [A] = 0.90 [V]
voltage drop [V] = 0.1 [Ω/m] * 2 * 45 [m] * 0.05 [A] = 0.45 [V]
total amount voltage drop = 8.10 [V]

With one power source



Select Sensor

576 199	NIVEL220, inclination sensor with R4852 interface

Select Cables and Accessories

748 488	0.8m power supply cable, connects power supply unit 722 409 to RS232/RS485 converter, Lemo-0 to 2 wires to terminal strip.
748 489	1.8m communication cable, connects Nivel220 to RS232/RS485 converter, Lemo-0 to 4 wires to terminal strip.
575 869	Terminator 120 Ohm, for RS485 Bus
RS232 cable	DB9 cable, DB9 male to DB9 female. Refer to "9.7.1 Cables".
Converter	RS232/RS485 converter. Refer to "9.1 RS232/RS485 converter".
Terminal strip	
CAT6 cable	
749 031	GHT59, Wall Mounting Kit for NIVEL200

Select Power

722 409	Power supply unit for GPS receiver, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to GPS.

Select power cords for 12V power supply unit 722 409. Refer to "5 Power supply".

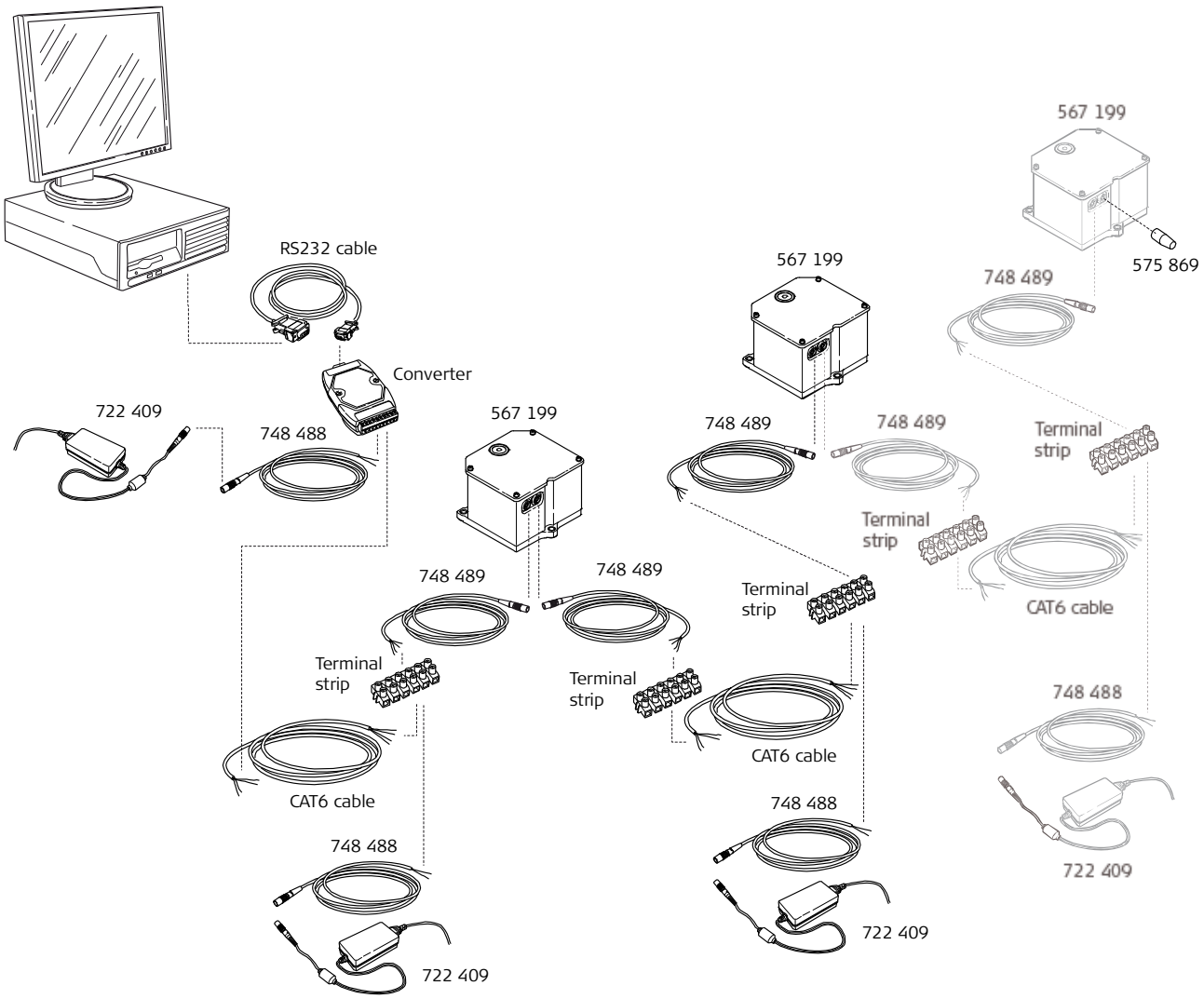
Select Software

GeoMoS Monitor / Analyzer	Refer to "1 GeoMoS Modules"
GNSS QC	Refer to "4.2.5 GNSS QC"

Important

- Use the **NivelTool** software from the CD to set the correct Nivel ID and baud rate.

With multiple power sources



Equipment list see above “With one power source”

Sensors

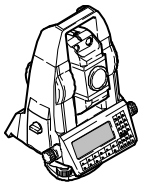
4.1 TPS Sensors

4.1.1 Supported Sensors

Leica TPS 1000 Series
Leica TPS 1100 Series
Leica TPS 1200 Series
Leica TM30/TS30 Series

Note: Only automated TPS can be used with GeoMoS. Instruments with ATR are recommended.

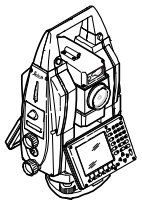
TM30, TCA2003 and TCA1800 instruments are recommended.



664 662 **TCA2003, 0.5"**(0.15mgon) automatic precision total station, with laser plummet, 2 control panels, accessories, user manual and container.

667 016 **TCA1800, 1"**(0.3mgon) automatic total station with laser plummet, 2 control panels, accessories, user manual and container.

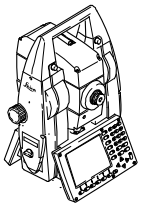
757 129 **TM30 0.5"**, 0.15gon, total station with reflectorless EDM (R1000), automatic target recognition, communication sidecover, internal memory, laser plummet, 1 keyboard, standard applications, user manuals, and upright container.



764 824 **TM30 1"**, 0.3gon, total station with reflectorless EDM (R1000), automatic target recognition, communication sidecover, internal memory, laser plummet, 1 keyboard, standard applications, user manuals, and upright container.

757 130 **TS30 0.5"**, 0.15gon, total station with reflectorless EDM (R1000), automatic target recognition, Power Search, communication sidecover, internal memory, laser plummet, 2 keyboard, electronic guide light EGL, standard applications, user manuals, and upright container.

TCA1201M instruments are recommended for long-range monitoring (>1000m)



748 872 TCA1201M, total station with long-range EDM for monitoring, automatic target recognition, laser plummet, 1 keyboard with touch screen, electronic guide light EGL, standard applications, user manual, and container.

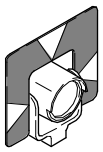
Customer Care Packages

A wide selection of comprehensive Customer Care Packages is available bundling Hardware Maintenance, Software Maintenance, Customer Support and Extended Warranty. For more information about the CCP offering in your country please contact your local Leica Geosystems organization or distribution partner.

4.1.2 Supported Reflectors

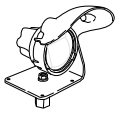
The number of prisms needed is dependent on the project.

Circular reflector



641 617 Circular prism GPR121 PRO, with holder and target plate

Monitoring prisms



726 295 GPR112 Monitoring-Mining Prism, with M8 internal thread in the back for direct mounting and 5/8" adapter.

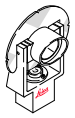
726 296 GHT112 Mounting set for GPR112 with M8 and 5/8" internal thread adapters, suitable for direct fixing systems on nearly every surface, prism is adjustable and fixable in two axes.

727 406 GDZ112, rain shelter for Monitoring Mining Prism GPR112. Full availability of the prism even in rainy conditions. The rain shelter protects the prism front against rain drops and dust which is washed out from of the air by rain.

Precision reflector

555 631 Single-prism precision reflector GPH1P.

Mini prism for short distances

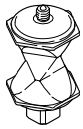


641 662 Mini prism GMP101, incl. bubble, target plate and spike, in bag, also suitable for GLS11 and GRT44 (same height as GPH1, additive constant +17.5mm)

641 762 Mini prism GMP104, with L-bar, for fixed installations.

360° Reflectors

639 985 GRZ4 360° Reflector.



754 384 Reflector with 5/8" thread adapter for mounting of GPS antenna.

4.1.3 Tribrachs

443 603 Tribrach GDF21 for TPS1000 Series, without optical plummet, light green.

667 304 Tribrach GDF121 PRO for TPS1200 Series, without optical plummet, pale green.

4.1.4 Other TPS Accessories

For additional information see:

740 623 Leica System 2000 Brochure.

738 605 Leica TPS1200 Series Equipment List

761 756 Leica Original Accessories Program

4.2 GNSS Sensors

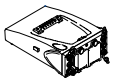
4.2.1 Supported Sensors

Leica GPS System 500
Leica GPS System 1200
Leica GMX900 Series

For detailed description and article numbers see Equipment lists for System 500/1200 and Equipment list for GNSS Networks and Reference Stations.

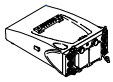
Note: The particular of model of that GNSS that is recommended depends on how the sensor connection is made to GeoMoS. If the GNSS is to be directly connected to GeoMoS (computation done on the sensor), RTK rover GNSS must be used. If the position computation is to be done by Leica GNSS Spider (recommended) then reference station GNSS or monitoring receivers should be used.

GNSS Sensors for Direct Connection to GeoMoS (RTK)



766 710 GX1220+, Geodetic GPS Dual Frequency Receiver. Sensor can be upgraded to GNSS receiver
766 711 GX1230+, Geodetic GPS Dual Frequency RTK Receiver. Sensor can be upgraded to GNSS receiver

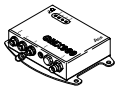
GNSS Sensors for Connection via GNSS Spider



766 730 GRX1200+, Triple Frequency GPS Reference Station Receiver, Professional, with Event Input, PPS Output, External Oscillator Input and Ethernet connectivity. Includes L2C.
766 733 GRX1200+, GPS/GLONASS/Galileo Triple Frequency Reference Station Receiver, Professional, with Event Input, PPS Output, External Oscillator Input and Ethernet connectivity. Includes L2C. Requires separate software options for full time GPS L5/GLONASS and Galileo.

Monitoring receiver

755 231 GMX901, GPS Smart Antenna for Monitoring Applications



758 600 GMX902 GG, GNSS Dual Frequency Receiver for Monitoring Applications.

Purchasable Options

For additional information see
745 972 Equipment list “For GNSS Networks and Reference Stations”

Customer Care Packages

A wide selection of comprehensive Customer Care Packages is available bundling Hardware Maintenance, Software Maintenance, Customer Support and Extended Warranty. For more information about the CCP offering in your country please contact your local Leica Geosystems organization or distribution partner.

Extended Warranty

89 332 1 year extended warranty for GMX902 GG
5301720 2 year extended warranty for GMX902 GG
5301721 Add 1 year GMX902 GG Warranty Extension
5301722 1 year extended warranty for GMX901
5301723 2 year extended warranty for GMX901
5301724 Add 1 year GMX901 Warranty Extension

Purchasable Options

744 590	GSW475, Sensor upgrade from GRX1200 Lite to GRX1200 Classic
758 420	GSW619, Sensor upgrade from GRX1200 Pro to GRX1200 GG Pro, incl. permanent GLONASS functionality. Only for GRX1200 Pro sensors with serial numbers between 355001 and 360000. For sensors outside this range, only GSW567 is required.

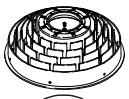
GMX900 Series vs GRX1200 Series - Differentiation

	GMX901	GMX902	GMX902 GG	GRX1200+	GRX1200+ GNSS
12 channels GPS, 1Hz L1 code/phase receiver	yes	-	-	-	-
120 channels GPS, 20Hz L1/L2 code/phase receiver +L5	-	yes	-	yes	-
120 channels GPS, GLONASS, Galileo, 20Hz L1/L2 code/phase receiver	-	-	yes	-	yes
Antenna	Internal	External	External	External	External
Raw data streaming	yes	yes	yes	yes	yes
Raw data logging onboard the receiver	-	-	-	yes	yes
RTK corrections directly from the receiver	-	-	-	yes	yes
Configuration and status display with web interface	-	-	-	yes	yes
Configuration and status display with GNSS Spider	yes	yes	yes	yes	yes
RT and PP coordinate calculation using GNSS Spider	yes	yes	yes	yes	yes
Advanced reference station firmware functionality	-	-	-	yes	yes
Number of serial ports	1	2	2	4	4
Advanced I/O ports	-	PPS	PPS	PPS. Event, External Oscillator, Ethernet	PPS. Event, External Oscillator, Ethernet
Power consumption	1.7 W	2.4 W	2.0 W	3.6 W	3.6 W
IP67	yes	yes	yes	yes	yes
Operating temperature –40° to +65°C	yes	yes	yes	yes	yes

4.2.2 Antennas

747 958 AX1203+ GNSS, GPS/GLONASS/Galileo Triple Frequency Antenna for all GRX1200 Series and GRX1200+ Series receivers.

766 714 AX1202 GG, Dual Frequency Antenna for GX1230 GG and GRX 1200 GG Pro Receiver



755 267 AT504 GG, GPS/GLONASS dual-frequency choke-ring antenna for GPS/GLONASS receivers. Dorne-Margolin antenna element, JPL design. Conforms to IGS "Typ T" specification for GPS antennas. For GX1220 / 1230, GRX1200 and GMX902 Receivers.

765 733 AR25, GNSS choke ring antenna for GPS/GLONASS/Galileo/Compass receivers. Includes L-Band signals. Dorne-Margolin antenna element.

667 140 GVP601, Weather-protection radome for AT504 choke ring antenna.

765 734 GVP653, Weather-protection radome AR25 choke ring antenna.

4.2.3 GNSS Accessories

667 200 Antenna cable, 1.2 m

636 959 Antenna cable, 2.8 m

632 372 Antenna cable, 10.0 m

632 390 Antenna cable, 30.0 m

664 813 Antenna cable, 50.0 m

713 483 Antenna cable, 70.0 m

733 257 MCF256, CompactFlash card 256MB.

745 995	MCF1000, CompactFlash card 1GB.

4.2.4 GNSS Spider

All active RT Positioning Products and PP Positioning Products configured in GNSS Spider with the **Send To** option set to **GeoMoS** can be used in GeoMoS. Thus many GNSS sensors maybe connected using a single entry in the GeoMoS Sensor Manager.

Required Options for Real Time Monitoring (RT Positioning Products)

740 244	Leica GNSS Spider, GNSS Reference Station Software, general license, with documentation. Supports full receiver control and configuration, manual downloads and firmware upgrade. Not protected.
744 912	Spider, Positioning Site license. Required for each GNSS site/sensor that shall be used for the Spider position processing. A minimum of two (2) of these licenses is needed for Positioning.

Required Options for Post Processed Monitoring (PP Positioning Products)

740 244	Leica GNSS Spider, GNSS Reference Station Software, general license, with documentation. Supports full receiver control and configuration, manual downloads and firmware upgrade. Not protected.
744 912	Spider, Positioning Site license. Required for each GNSS site/sensor that shall be used for the Spider position processing. A minimum of two (2) of these licenses is needed for Positioning.
744 904	Spider, File Products Service (FPS) option. Provides automated data download and management for multiple sites with automated RINEX conversion, quality control, event logging, FTP transfer for distributing Spider product files on the Internet. Option includes one (1) site/sensor license. For more site/sensor licenses for a Spider FPS, order one or more "Spider, FPS Additional Site License" as required.
734 613	Spider, FPS Additional Site License. Required for each GNSS site/sensor that shall be used with Spider File Product Service in addition to the default one (1) site/sensor, which is included as standard.

Note: 744912 Positioning Site Licences are cumulative between Real-Time and Post-Processing Positioning Products. For example, to use 10 sites simultaneously in both Real-Time and Post-Processing Products requires 20 Positioning Site Licences. There is no limit to the number of Positioning Products (baselines) that may be configured if the number of sites used (including reference and rover sites) does not exceed the number of Positioning Site Licences.

For additional information see:

745 972	Equipment list “For GNSS Networks and Reference Stations”

4.2.5 GNSS QC

GNSS QC can be used as an alternative to GeoMoS as a low cost analyzer for use together with GNSS Spider for GPS-only monitoring. The Advanced Coordinate Analysis option includes support for 20Hz real time NMEA data, Spider post processing data, profiling, limit checks and messaging. GNSS QC can be also used for site selection and quality checking of the raw GNSS data.

Required Options for Analysis of Real Time and Post Processed Positioning Data from Spider

749 319	Leica GNSS QC, GNSS Reference Station software with documentation. For data analysis and quality control of GNSS reference station data. Dongle protected.
751 824	GNSS QC, Advanced Coordinate Analysis option. High speed calculation and graphing of displacement, messaging and limit checks for real time NMEA and GNSS Spider Post Processing coordinate data. Dongle protected.

For additional information see:

745 972	Equipment list “For GNSS Networks and Reference Stations”

4.3 Levels

4.3.1 Supported Sensors

723 289 DNA03, 0.3mm, precision digital level, magnetically-damped compensator, with user manual and container.

726 540 DNA10, 0.9mm, digital level, magnetically-damped compensator, with user manual and container.

738 933 SPRINTER 100M, 2.0mm, electronic level, with RS232 interface & internal memory, with user manual, 4 pcs AA dry cells and container.

741 868 SPRINTER 200M, 1.5mm, electronic level, with RS232 interface & internal memory, with user manual, 4 pcs AA dry cells and container.

Customer Care Packages

A wide selection of comprehensive Customer Care Packages is available bundling Hardware Maintenance, Software Maintenance, Customer Support and Extended Warranty. For more information about the CCP offering in your country please contact your local Leica Geosystems organization or distribution partner.

4.3.2 DNA Staffs

560 271 Invar bar code levelling staff GPCL3, 3m, with circular level.

560 274 Invar bar code levelling staff GPCL3, 3m, with circular level, with expansion coefficient certificate and length calibration certificate.

563 659 Invar bar code levelling staff GPCL2, 2m, with circular level.

632 313 Industrial bar code levelling staff GWCL92, 92 cm, invar staff with circular bubble and 2 interchangeable bases.

563 733 Invar bar code scale GWCL60, 60 cm

522 793 Dual face levelling staff GKNL4F, 13.3ft, 3 sections, code/ft graduation, with handles and circular bubble, in transport bag

667 113 Telescopic levelling staff GTL4C, 4m, aluminium, bar code/mm-graduation, with bull`s-eye bubble, in transport bag

4.3.3 Sprinter Staffs

741 882 GSS111, Dual face telescopic levelling staff, 5m, 4 sections, SPRINTER barcode / E-Scale cm-graduation, with circular bubble, in transport bag (Standard version).

741 883 GSS111-1, Dual face telescopic levelling staff, 5m (16.4ft), 4 sections, SPRINTER barcode / ft-graduation, with circular bubble, in transport bag, (Imperial version).

741 884 GSS112-3, Dual face telescopic levelling staff, 4m, 4 sections, SPRINTER barcode / E-Scale cm-graduation, with circular bubble, in transport bag (UK version).

741 885 GSS111-2, Dual face telescopic levelling staff, 5m, 4 sections, SPRINTER barcode / 5mm-graduation, with circular bubble, in transport bag (Japan version).

741 886 GSS112-5, Dual face telescopic levelling staff, 4m, 4 sections, SPRINTER barcode / 2mm-graduation, with circular bubble, in transport bag (Spain version).

746 613 GSS112, Dual face telescopic levelling staff, 4m, 4 sections, SPRINTER barcode / E-Scale cm-graduation, with circular bubble, in transport bag (Standard version).

746 614 GSS122-3, Dual face telescopic (Fibreglass) levelling staff, 4m, 4 sections, SPRINTER barcode / E-Scale cm-graduation, with circular bubble, in carry case (UK version).

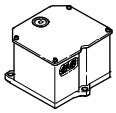
For additional information see:

761 756 Leica Original Accessories Program

4.4 Other Sensors

4.4.1 Inclination Sensors

The Nivel20 and Nivel200 are a series of highly precise inclination sensors from Leica Geosystems. The following instruments are supported.



576 198 NIVEL210, inclination sensor with RS232 interface
576 199 NIVEL220, inclination sensor with RS485 interface

575 869 Terminator for RS485. One terminator must be ordered and installed for each installation with Nivel220 sensors.

Other accessories

Inclination Sensors need to have mounting, shelters and cables.

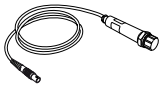
749 031 GHT59, Wall Mounting Kit for NIVEL200

For cables refer to “6.6 Nivel210 / Nivel220 cables”.

For additional information see:

749 597 "Leica Nivel210 and Nivel220 sensors Equipment List"

4.4.2 Meteo Sensors



667 726 STS DTM meteo sensor, combined pressure and temperature sensor, 2.0m cable with Lemo 1

Other accessories

Meteo Sensors need to have mountings, shelters and cables.

Refer to “6.7 Meteo sensor cables” to connect a meteo sensor.

Refer to “3.8 Setup a Meteo Sensor”.

Power supply

The PC and the sensors need to have a permanent power supply.

Do not us an internal battery when using the Switchbox (744 794).

5.1 Continuous 12V Power supply for GPS1200 and NIVEL sensors

A permanent 12V power supply is needed for sensors

722 409 Power supply unit, for indoor use only, input 100V-240VAC 50-60HZ, output 12VDC, cable with 5-pin Lemo.
Standard mains/line cable select from following list.

Select power cords for 12V power supply unit 722 409:

731 772	Power Cord for Dual Bay Charger GKL24 or Power supply unit, US-Version.
731 773	Power Cord for Dual Bay Charger GKL24 or Power supply unit, EU-Version.
734 232	Power Cord for Dual Bay Charger GKL24 or Power supply unit, UK-Version.
734 233	Power Cord for Dual Bay Charger GKL24 or Power supply unit, AUS-Version.
738 586	Power Cord for Dual Bay Charger GKL24 or Power supply unit, CH-Version.

5.2 Continuous 12V Power supply for TPS sensors

A permanent 12V power supply is needed for sensors

749 279 GEV208, Power supply unit for TPS, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect power cables.
Standard mains/line cable select from the following list.

Select power cords for 12V power supply unit 749 279:

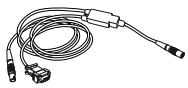
731 722	Power Cord, US-Version.
731 773	Power Cord, EU-Version.
734 232	Power Cord, UK-Version.
734 233	Power Cord, AUS-Version.
738 586	Power Cord, CH-Version.

Cables

A permanent power supply is needed during the measurements.
The communication between sensor and PC has to be permanently connected during the measurements.

6.1 Total station cables

439 038 GEV71, 4m car battery cable, connects TPS or GPS receiver (Lemo-1, 5 pin, female) to 12V car battery. (Note, for TPS e.g. the additional cable 734 698 is required.)



734 698 GEV187, Y-cable, connects TPS to PC (9-pin RS232 serial) and external battery, 2.0m.

759 257 GEV220, Y-cable, connects TM30/TS30 to PC (9-pin RS232 serial) and external battery, 2.0m.

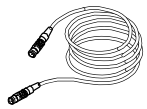
6.2 GPS1200 / GMX902 cables

To connect two independent power supplies

733 298 GEV172, 2.8m Y-cable, connects GPS Receiver with two external power supplies.

To connect battery, car battery or alternate power supply

439 038 GEV71, 4m car battery cable, connects TPS or GPS receiver (Lemo-1, 5 pin, female) to 12V car battery. (Note, for GPS e.g. the 560 130 or 636 972 is required.)



560 130 1.8m cable, connects GEB171 external battery to GPS1200 receiver. Lemo-1, 5 pin, male to Lemo-1, 5 pin, male.

636 972 0.5m cable, connects GEB171 external battery to GPS1200 receiver. Lemo-1, 5 pin, male to Lemo-1, 5 pin, male.

722 411 Cable with protection fuse to connect 12V power supply to GPS receiver.

To transfer data between sensor and spider

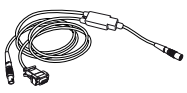
733 280 GEV160, 2.8m Data transfer cable. Connects GPS1200 receiver Ports 1, 2 and 3, RX1220 or GMX902 to PC for data transfer, firmware upload etc. Lemo 8 to 9 pin RS232 female serial connector.

563 809 GEV113, 2.8m Modem cable. Connects GPS receiver Ports 1, 2 and 3 to modem. Lemo 8 Pin to 9 Pin RS232 male serial connector.

733 290 GEV168, 5.0m cable, connecting GPS Receiver with Ethernet LAN / RJ45

6.3 GMX901 cables

750 073 GEV212, Interface Cable, 5m, GMX901 to unterminated, connects GMX901 to a custom installation.



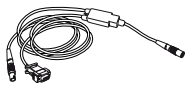
743 389 GEV197, Y-Cable, 2.8m, GMX901 to RS232 and external Leica power supply.

6.4 Antenna cables

667 200	Antenna cable, 1.2 m
636 959	Antenna cable, 2.8 m
632 372	Antenna cable, 10.0 m
632 390	Antenna cable, 30.0 m
664 813	Antenna cable, 50.0 m
713 483	Antenna cable, 70.0 m

6.5 Level cables

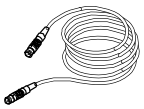
439 038 GEV71, 4m car battery cable, connects TPS or GPS receiver (Lemo-1, 5 pin, female) to 12V car battery. (Note, for TPS e.g. the additional cable 734 698 is required.)



734 698 GEV187, Y-cable, connects TPS to PC (9-pin RS232 serial) and external battery, 2.0m.

6.6 Nivel210 / Nivel220 cables

To connect a Nivel210 directly to GPS1200



749 916 1.8m communication and connection cable, GEV209, Nivel210 to GPS1200

To connect a Nivel210 directly to PC

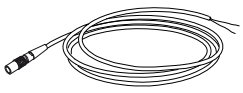
802 902 1.0m connection cable, connects Nivel210 sensor ports 1 or 2 to PC for data communication etc., Lemo-0 to 9 pin RS232 serial connector.

748 335 GEV204, Power supply-cable for NIVEL210 and NIVEL230. (Lemo -Lemo), 1.8m.

To connect a Nivel220

802 906 5.0m connection cable RS485. Connects two Nivel220 sensor ports 1 or 2, Lemo-0 to Lemo-0.

802 907 20.0m connection cable RS485. Connects two Nivel220 sensor ports 1 or 2, Lemo-0 to Lemo-0.



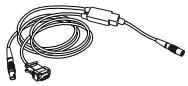
748 488 0.8m power supply cable, connects power supply unit 722 409 to RS232/RS485 converter, Lemo-0 to 2 wires to terminal strip.

748 489 1.8m communication cable, connects Nivel220 to RS232/RS485 converter, Lemo-0 to 4 wires to terminal strip.

6.7 Meteo sensor cables

To connect GEV187 and DTM meteo sensor

764 328 GEV222, Adapter cable DTM sensor, Lemo-1 (female) to Lemo-0 (female), 3.0m



734 698 GEV187, Y-cable, connects TPS to PC (9-pin RS232 serial) and external battery, 2.0m.

439 038 GEV71, 4m car battery cable, connects TPS or GPS receiver (Lemo-1, 5 pin, female) to 12V car battery. (Note, for DTM meteo sensor e.g. the additional cable 734 698 is required.)

6.8 Power cables

For power cables please refer to section "5 Power supply".

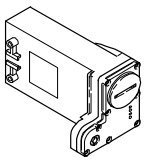
6.9 Radio modem / mobile phones cables

For Satelline Radio modem, TCPS27 radio modem and GFU24 cables please refer to section "7 For transmitting data".

For transmitting data

7.1 Satelline Radio Modem, Radio Antennas and Accessories

Satelline Radio Modems

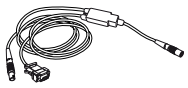


733 275	GFU14-0, Satelline 3AS radio modem (433.525 MHz, 25.0 kHz channel spacing, 0.5 W) already integrated into housing, fits on side of GPS Receiver. (User manual and CE-Declaration of Conformity included).
733 276	GFU14-1, Satelline 3AS radio modem (406.425 MHz, 25.0 kHz channel spacing, 1.0 W) already integrated into housing, fits on side of GPS Receiver. (User manual and CE-Declaration of Conformity included).
738 272	GFU14-2, Satelline 3AS radio modem (445.000 MHz, 12.5 kHz channel spacing, 1.0 W) already integrated into housing, fits on side of GPS Receiver. (User manual and CE-Declaration of Conformity included).
738 273	GFU14-3, Satelline 3AS radio modem (443.000 MHz, 12.5 kHz channel spacing, 1.0 W) already integrated into housing, fits on side of GPS Receiver. (User manual and CE-Declaration of Conformity included).
738 274	GFU14-4, Satelline 3AS radio modem (440.550 MHz, 25.0 kHz channel spacing, 0.5 W) already integrated into housing, fits on side of GPS Receiver. (User manual and CE-Declaration of Conformity included).
738 275	GFU14-5, Satelline 3AS radio modem (458.150 MHz, 12.5 kHz channel spacing, 1.0 W) already integrated into housing, fits on side of GPS Receiver. (User manual and CE-Declaration of Conformity included).
738 276	GFU14-6, Satelline 3AS radio modem (439.8625 MHz, 12.5 kHz channel spacing, 1.0 W) already integrated into housing, fits on side of GPS Receiver. (User manual and CE-Declaration of Conformity included).

Select according to frequency of radio modem

639 964	GAT1, Gainflex radio antenna, frequency range 400-435MHz.
667 243	GAT2, Gainflex radio antenna, frequency range 435-470MHz.

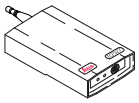
Programming Cable for Satelline Radio Modem



733 297	GEV171, 1.8m cable to program, the Satelline 3AS radio modem inside the GFU14 housing.

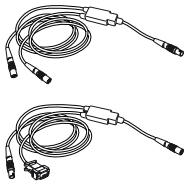
7.2 TCPS27 Radio Modem and Accessories

TCPS27 Radio Modems



734 161	TCPS27 B, radio modem (base), with antenna, user manual. Used as radio modem for TPS1200 (frequency range 2400 - 2483 Mhz).
734 162	TCPS27 R, radio modem (remote), with antenna, user manual. Used as external radio for PC (frequency range 2400 - 2483 MHz).

Cables for TCPS27 Radio Modems

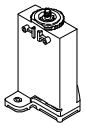


734 697	GEV186, Y-cable, connects TCPS27 to TPS/1000/1100/1200 and external battery, 1.8m.
771 057	GEV236, Y-cable, connects TM30/TS30 to TCPS radio and external battery, 2m.
734 699	GEV188, Y-cable, connects TCPS27 to PC (9-pin RS232 serial) and external battery, 1.8m.
---	Coaxial cable, connects antenna to TCPS27

Important

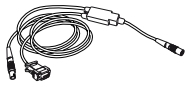
- Use the **TCPS27 ConfigTool** from the CD to set the correct baud rate and link number.
- Enable the **RTS mode** in the GeoMoS Monitor software.

7.3 Mobile Phones and Accessories



750 242 GFU24, Housing with Siemens MC75 GSM/GPRS Module (Quad-Band GSM 850/900/1800/1900 MHz).

667 237 Antenna for 900/1800 MHz mobile network.



733 297 GEV171, 1.8m cable to program, the Satelline 3AS radio modem inside the GFU14 housing. Also used to connect GFU17 to PC.

Other Accessories

8.1 Switchbox

Essential tool for permanent monitoring, supports cold boot for TPS

744 793	Switchbox with a 2.0m cable for TPS1000/ TPS 1100/ TPS 1200 (Lemo 0) and GeoMoS.
772 630	GDZ 68, Switchbox with a 2.0m cable for TM30/TS30 (Lemo 1) and GeoMoS

Third party devices

Leica Geosystems tested and uses the following devices in local Leica monitoring solutions:

9.1 RS232/RS485 converter

I-7520

RS232 to RS485 converter for Nivel220 sensors

http://www.icpdas.com
http://www.icpdas.com/products/Remote_IO/i-7000/i-7520.htm

This is a product of ICP DAS Co.

9.2 RS232/Ethernet converter

Model 58631,
Model 58633

RS232 to Ethernet converter for total stations and Nivel210 sensors

http://www.wut.de
1 serial port http://www.wut.de/e-58631-ww-daus-000.php
3 serial ports http://www.wut.de/e-58633-ww-daus-000.php

This is a product of Wiesemann & Theis GmbH.

MOXA5110

RS232 to Ethernet converter for total stations and Nivel210 sensors

http://www.moxa.com
1 serial port http://www.moxa.com/Product/NPort_5110.htm
Use the –T models for outdoor installations

This is a product of Moxa Inc.

9.3 Wireless modem

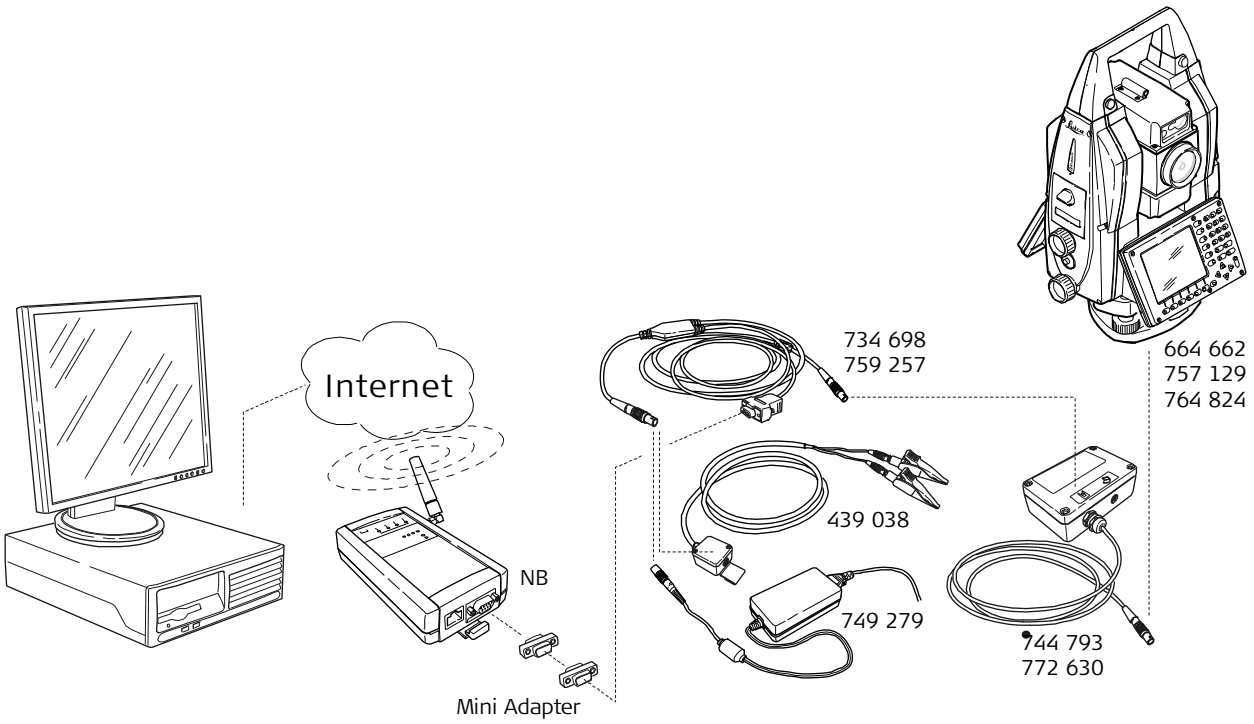
NB2210

The NB2210 connects Ethernet enabled equipment to the internet over a mobile network (GSM/GPRS/EDGE)

http://www.netmodule.com/en/
http://www.netmodule.com/en/products/nb/nb2210.aspx

This is a product of NetModule Inc.

9.3.1 Remote Setup of a Total Station with a Wireless Modem (e.g. NB2210)



Select Total Station

664 662	**TCA2003, 0.5"**(0.15mgon) automatic precision total station, with laser plummet, 2 control panels, accessories, user manual and container.
757 129	**TM30 0.5"**, 0.15gon, total station with reflectorless EDM (R1000), automatic target recognition, communication sidecover, internal memory, laser plummet, 1 keyboard, standard applications, user manuals, and upright container.
764 824	**TM30 1"**, 0.3gon, total station with reflectorless EDM (R1000), automatic target recognition, communication sidecover, internal memory, laser plummet, 1 keyboard, standard applications, user manuals, and upright container.

Select Cables and Switchbox

744 793	Switchbox with cable 2.0m for TPS/1000/1100/1200 and GeoMoS. Supports cold boot for TPS (important 24/7 hours/day monitoring).
772 630	GDZ 68, Switchbox with a 2.0m cable for TM30/TS30 (Lemo 1) and GeoMoS. Supports cold boot for TPS (important 24/7 hours/day monitoring).
734 698	GEV187, Y-cable, connects TPS/1000/1100/1200 to PC (9-pin RS232 serial) and external battery, 2.0m.
759 257	GEV220, Y-cable, connects TM30/TS30 to PC (9-pin RS232 serial) and external battery, 2.0m.
Mini adapter	Null modem, DB9 male to DB9 female. Refer to "9.6.2 Mini adapter".
Gender changer	Gender changer, DB9 male to DB9 male. Refer to "9.6.2 Mini adapter".

Select Power

439 038	GEV71, 4m car battery cable, connects TPS or GPS receiver to 12V car battery.
749 279	GEV208, Power supply unit for TPS, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to TPS.

Select power cords for 12V power supply unit 749 279. Refer to "5 Power supply".

Select Wirless Modem

NB2210	The NB2210 connects Ethernet enabled equipment to the internet over a mobile network (GSM/GPRS/EDGE). Refer to "9.2 Wireless modem".

Select Software

	GeoMoS Monitor / Analyzer Refer to "1 GeoMoS Modules"

9.4 Digital IO card

Web IO 2x Digital Input, 2x Digital Output

The Web IO (2x Digital Input, 2x Digital Output) connects digital input and output ports of industrial 24V technology to the network.

http://www.wut.de
http://www.wut.de/e-57633-ww-daus-000.php

This is a product of Wiesemann & Theis GmbH.

9.5 Datalogger

CR1000 Multiplexer

CR1000 MEASUREMENT AND CONTROL MODULE C/W CR1000WP
AM16/32A 16/32 CHANNEL RELAY MULTIPLEXER C/W SPARK GAPS

http://www.campbellsci.com/cr1000
http://www.campbellsci.com/index.cfm

This is a product of Campbell Scientific Ltd.

9.6 Wireless Ethernet Radio

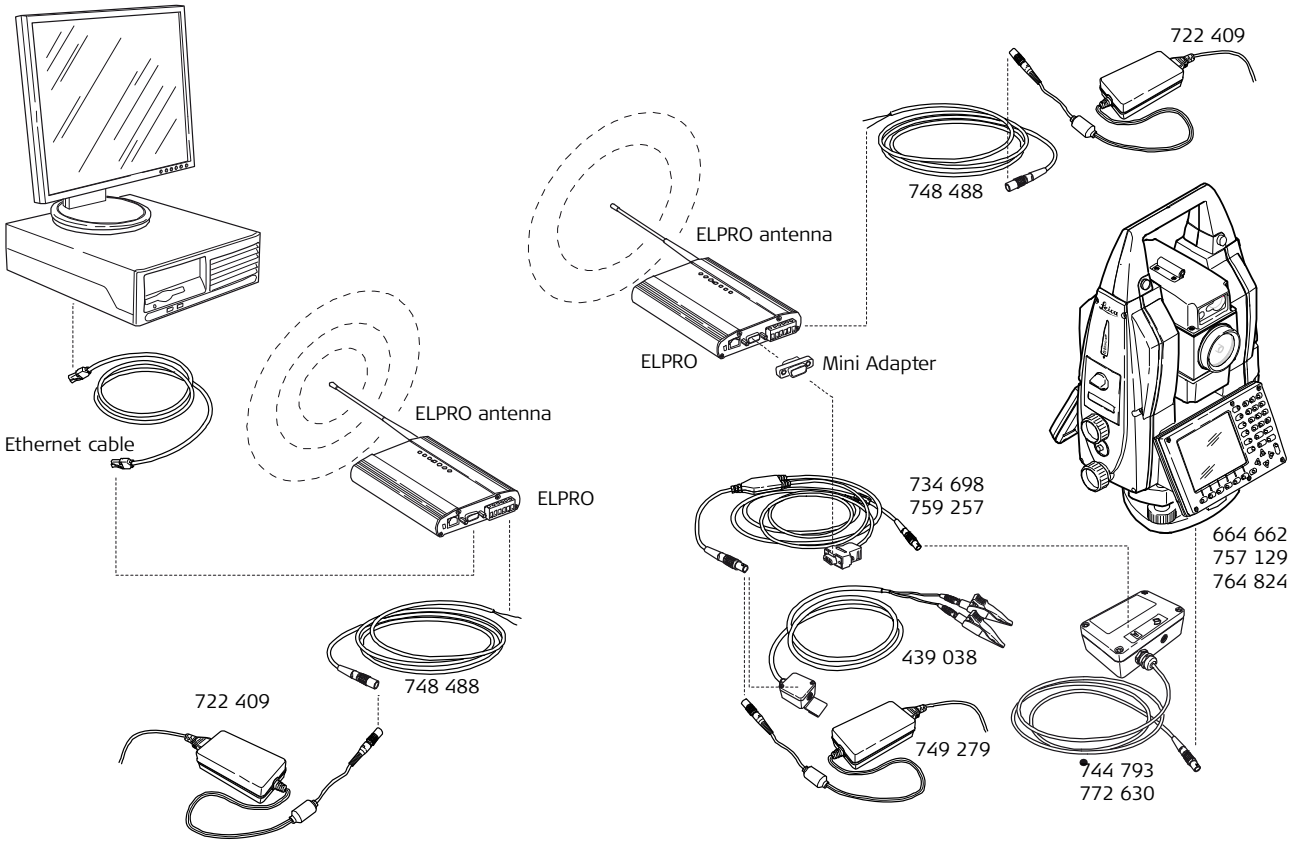
ELPRO 805U-E

The ELPRO 805U connects serial or Ethernet devices by industrial wireless radio modems.

http://www.elprotech.com/
http://www.elprotech.com/index.cfm?content=280

This is a product of ELPRO Technologies.

9.6.1 Remote Setup of a Total Station with Radio (ELPRO 805U-E)



Select Total Station

664 662	**TCA2003, 0.5"**(0.15mgon) automatic precision total station, with laser plummet, 2 control panels, accessories, user manual and container.
757 129	**TM30 0.5"**, 0.15gon, total station with reflectorless EDM (R1000), automatic target recognition, communication sidecover, internal memory, laser plummet, 1 keyboard, standard applications, user manuals, and upright container.
764 824	**TM30 1"**, 0.3gon, total station with reflectorless EDM (R1000), automatic target recognition, communication sidecover, internal memory, laser plummet, 1 keyboard, standard applications, user manuals, and upright container.

Select Cables and Switchbox

744 793	Switchbox with cable 2.0m for TPS/1000/1100/1200 and GeoMoS. Supports cold boot for TPS (important 24/7 hours/day monitoring).
772 630	GDZ 68, Switchbox with a 2.0m cable for TM30/TS30 (Lemo 1) and GeoMoS. Supports cold boot for TPS (important 24/7 hours/day monitoring).
734 698	GEV187, Y-cable, connects TPS/1000/1100/1200 to PC (9-pin RS232 serial) and external battery, 2.0m.
759 257	GEV220, Y-cable, connects TM30/TS30 to PC (9-pin RS232 serial) and external battery, 2.0m.
748 488	0.8m power supply cable, connects power supply unit 722 409 to RS232/RS485 converter, Lemo-0 to 2 wires to terminal strip.
Mini adapter	Null modem, DB9 male to DB9 male. Refer to "9.7.2 Mini adapter".
Ethernet cable	Refer to "9.7.1 Cables".

Select Radio Modem

ELPRO	Interconnect serial or Ethernet devices by industrial wireless radio modems. Refer to "9.6 Wireless Ethernet Radio".

Select Power

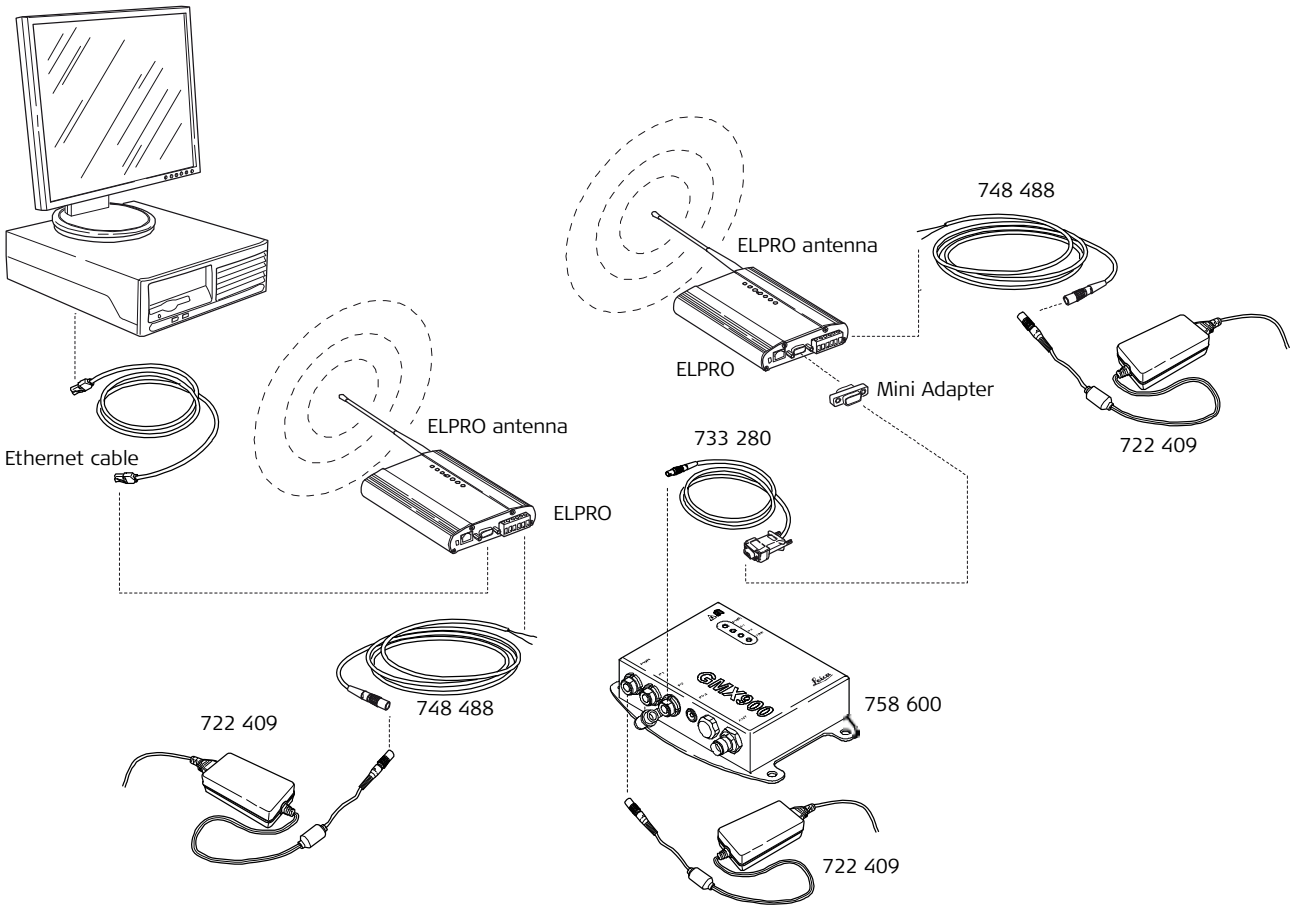
439 038	GEV71, 4m car battery cable, connects TPS or GPS receiver to 12V car battery.
749 279	GEV208, Power supply unit for TPS 2003, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to TPS.
722 409	Power supply unit, for indoor use only, input 100V-240VAC 50-60HZ, output 12VDC, cable with 5-pin Lemo.

Select power cords for 12V power supply unit 722 409 and 749 279. Refer to “5 Power supply”.

Select Software

GeoMoS Monitor / Analyzer	Refer to “1 GeoMoS Modules”

9.6.2 Remote Setup of a GMX902 with Radio (ELPRO 805U-E)



Select Receiver

758 600	GMX902 GG, GNSS Dual Frequency Receiver for Monitoring Applications.

Select Cables

733 280	GEV160, 2.8m Data transfer cable. Connects GPS1200 receiver Ports 1, 2 and 3, RX1220 or GMX902 to PC for data transfer, firmware upload etc. Lemo 8 Pin to 9 pin RS232 female serial connector.
748 488	0.8m power supply cable, connects power supply unit 722 409 to RS232/RS485 converter, Lemo-0 to 2 wires to terminal strip.
Mini adapter	Null modem, DB9 male to DB9 male. Refer to "9.7.2 Mini adapter".
Ethernet cable	Refer to "9.7.1 Cables".

Select Antenna

747 958	AX1203+ GNSS, GPS/GLONASS/Galileo Triple Frequency Antenna for all GRX1200 Series and GRX1200+ Series receivers.
766 714	AX1202 GG, Dual Frequency Antenna for GX1230 GG and GRX 1200 GG Pro Receiver
755 267	AT504 GG, GPS/GLONASS dual-frequency choke-ring antenna for GPS/GLONASS receivers. Dorne-Margolin antenna element, JPL design. Conforms to IGS "Typ T" specification for GPS antennas. For GX1220 / 1230, GRX1200 and GMX902 Receivers.
765 733	AR25, GNSS choke ring antenna for GPS/GLONASS/Galileo/Compass receivers. Includes L-Band signals. Dorne-Margolin antenna element.
667 140	GVP601, Weather-protection radome for AT504 choke ring antenna.
765 734	GVP653, Weather-protection radome AR25 choke ring antenna.

Select Antenna Cables

632 372	Antenna cable, 10 m
632 390	Antenna cable, 30 m

Select Radio Modem

ELPRO	Interconnect serial or Ethernet devices by industrial wireless radio modems. Refer to "9.6 Wireless Ethernet Radio".

Select Power

722 409	Power supply unit for GPS receiver, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to GPS.

Select power cords for 12V power supply unit 722 409. Refer to "5 Power supply".

Select Software

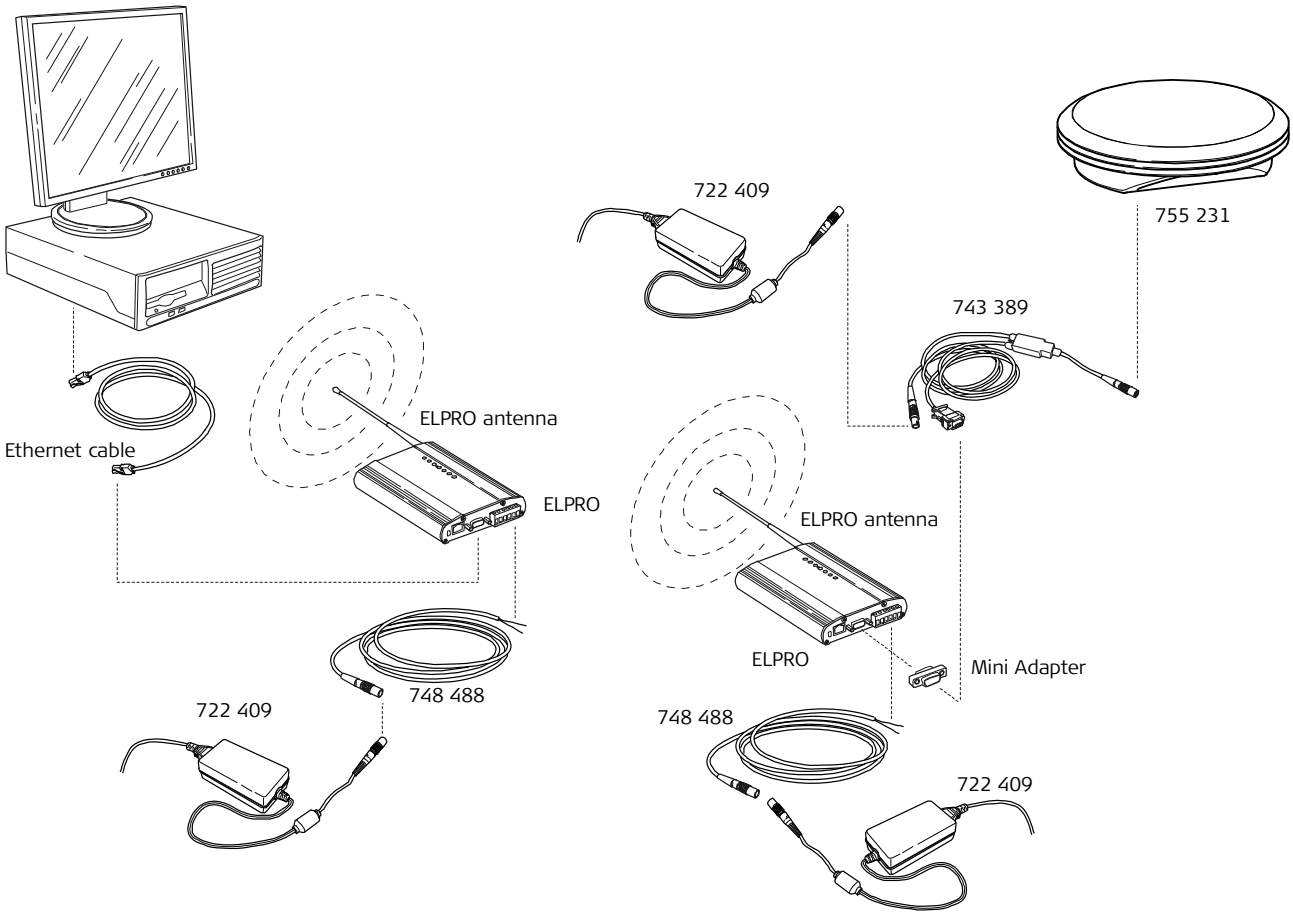
Leica GNSS Spider	Refer to "4.2.4 GNSS Spider"

Optional Software

GeoMoS Monitor / Analyzer	Refer to "1 GeoMoS Modules"
Leica GNSS QC	Refer to "4.2.5 GNSS QC"

Note: If you connect more than one GNSS receiver to GeoMoS to use for monitoring we recommend GNSS connection to the Leica Spider software. GeoMoS supports an interface to Leica GNSS Spider software (order GNSS Spider and accessories separately)

9.6.3 Remote Setup of a GMX901 with Radio (ELPRO 805U-E)



Select Receiver

755 231	GMX901, GPS Smart Antenna for Monitoring Applications

Select Cables

743 389	GEV197, Y-Cable, 2.8m, GMX901 to RS232 and external Leica power supply.
748 488	0.8m power supply cable, connects power supply unit 722 409 to RS232/RS485 converter, Lemo-0 to 2 wires to terminal strip.
Mini adapter	Null modem, DB9 male to DB9 male. Refer to "9.7.2 Mini adapter".
Ethernet cable	Refer to "9.7.1 Cables".

Select Radio Modem

ELPRO	Interconnect serial or Ethernet devices by industrial wireless radio modems. Refer to "9.6 Wireless Ethernet Radio".

Select Power

439 038	GEV71, 4m car battery cable, connects TPS or GPS receiver to 12V car battery.
722 409	Power supply unit for GPS receiver, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to GPS.

Select power cords for 12V power supply unit 722 409. Refer to "5 Power supply".

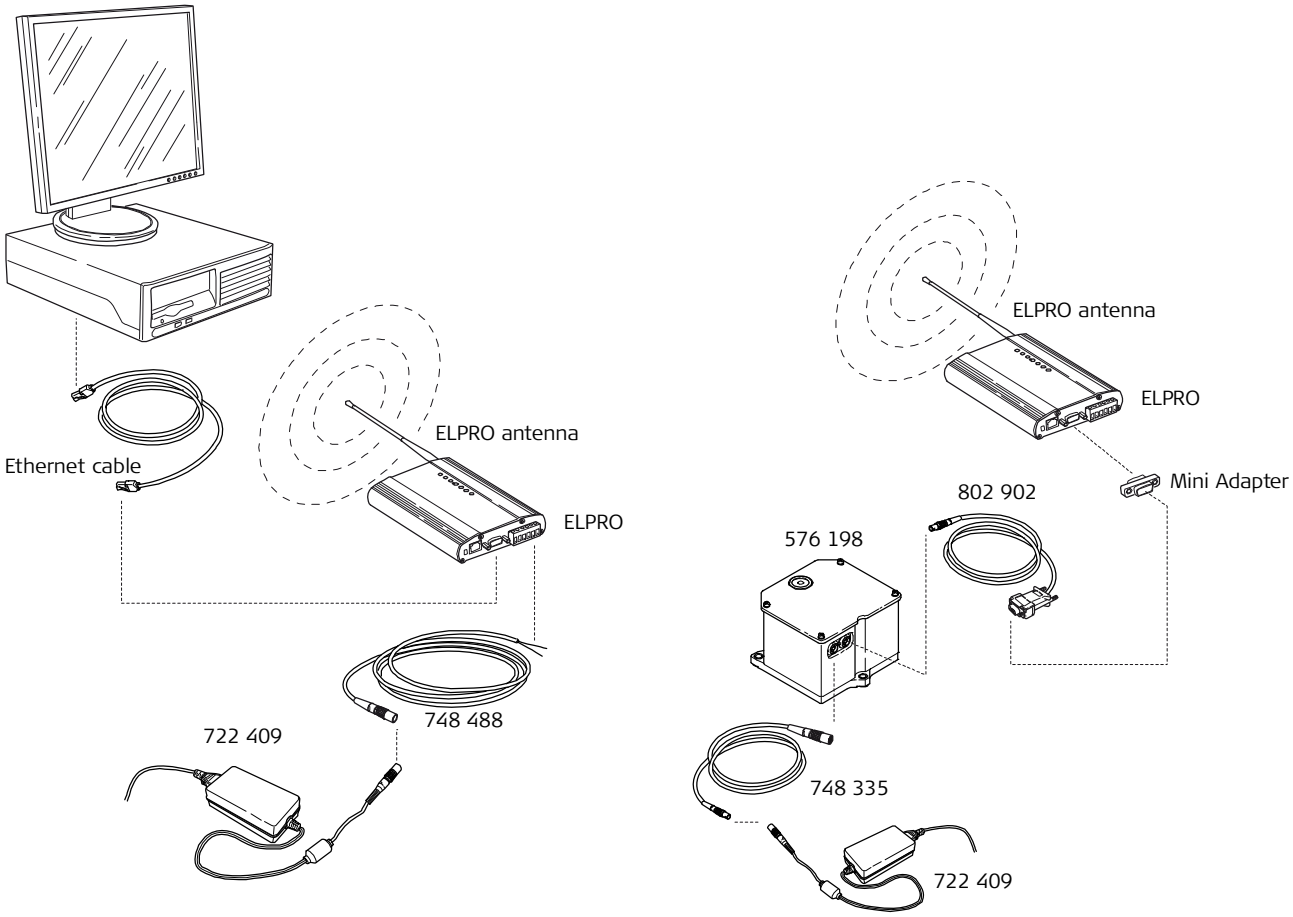
Select Software

Leica GNSS Spider	Refer to "4.2.4 GNSS Spider"

Optional Software

GeoMoS Monitor / Analyzer	Refer to "1 GeoMoS Modules"
Leica GNSS QC	Refer to "4.2.5 GNSS QC"

9.6.4 Remote Setup of a Nivel210 with Radio (ELPRO 805U-E)



Select Sensor

576 198	NIVEL210, inclination sensor with RS232 interface

Select Cables

748 335	GEV204, Power supply-cab.f. NIVEL210/230
802 902	Cable, PC- NIVEL210, (Lemo-RS232), 1m
748 488	0.8m power supply cable, connects power supply unit 722 409 to RS232/RS485 converter, Lemo-0 to 2 wires to terminal strip.
Mini adapter	Null modem, DB9 male to DB9 male. Refer to "9.7.2 Mini adapter".
Ethernet cable	Refer to "9.7.1 Cables".

Select Radio Modem

ELPRO	Interconnect serial or Ethernet devices by industrial wireless radio modems. Refer to "9.6 Wireless Ethernet Radio".

Select Power

722 409	Power supply unit for GPS receiver, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to GPS.

Select power cords for 12V power supply unit 722 409. Refer to "5 Power supply".

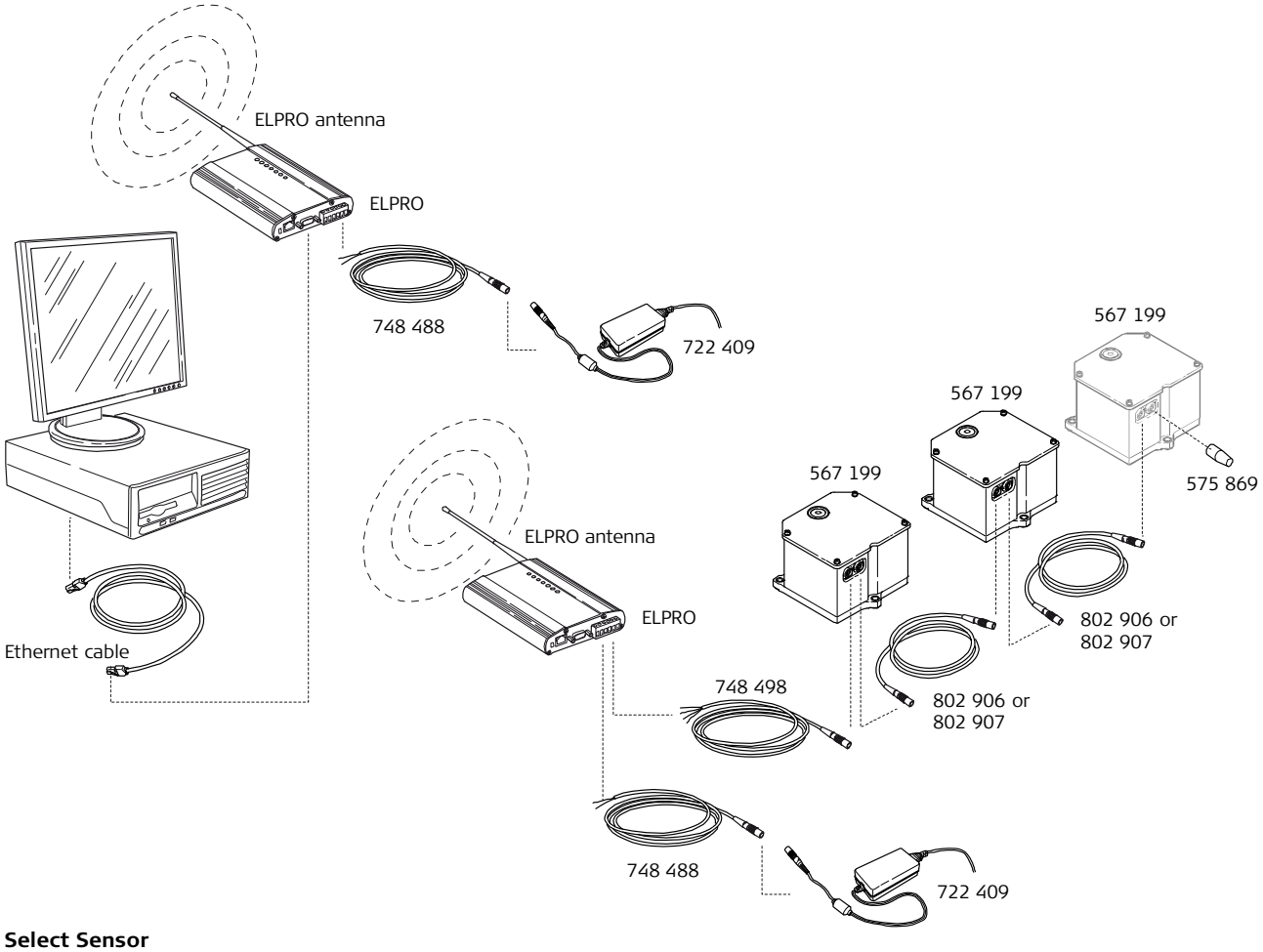
Select Software

GeoMoS Monitor / Analyzer	Refer to "1 GeoMoS Modules"
GNSS QC	Refer to "4.2.5 GNSS QC"

Important

- Use the **NivelTool** software from the CD to set the correct Nivel ID and baud rate.

9.6.5 Remote Setup of multiple Nivel220 with Radio (ELPRO 805U-E)



Select Sensor

576 199	NIVEL220, inclination sensor with R4852 interface

Select Cables

748 488	0.8m power supply cable, connects power supply unit 722 409 to RS232/RS485 converter, Lemo-0 to 2 wires to terminal strip.
748 498	1.8m communication cable, connects Nivel220 to RS232/RS485 converter, Lemo-0 to 4 wires to terminal strip.
802 906	5.0m connection cable RS485. Connects two Nivel220 sensor ports 1 or 2, Lemo-0 to Lemo-0.
802 907	20.0m connection cable RS485. Connects two Nivel220 sensor ports 1 or 2, Lemo-0 to Lemo-0.
575 869	Terminator 120 Ohm, for RS485 Bus
Ethernet cable	Refer to "9.7.1 Cables".

Select Radio Modem

ELPRO	Interconnect serial or Ethernet devices by industrial wireless radio modems. Refer to "9.6 Wireless Ethernet Radio".

Select Power

722 409	Power supply unit for GPS receiver, for indoor use only, input 100V-240VAC 50-60HZ, output 12VCD, cable with 5-pin Lemo to connect to GPS.

Select power cords for 12V power supply unit 722 409. Refer to "5 Power supply".

Select Software

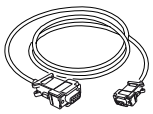
GeoMoS Monitor / Analyzer	Refer to "1 GeoMoS Modules"
GNSS QC	Refer to "4.2.5 GNSS QC"

Important

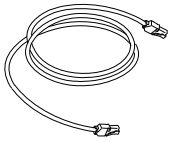
- Use the **NivelTool** software from the CD to set the correct Nivel ID and baud rate.

9.7 Accessories

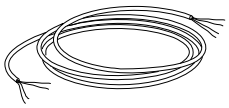
9.7.1 Cables



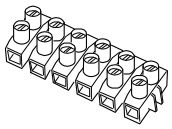
RS232 cable or so-called DB9 cable



Ethernet cable



CAT6
Shielded cable



Terminal strip
Mount in a box

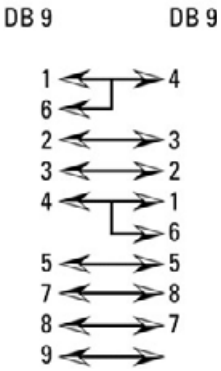
9.7.2 Mini adapter

Null modem or RS232 reverser

A null modem (or RS232 reverser) reroutes wiring.

Specification

A null modem crosses pins 2 and 3, so that pin 2 on one side is connected to pin 3 on the other.



Gender changer

A gender changer is a small hardware device or adapter that is used to correct the connector mismatches of cables.

Specification

Pins connected 1:1

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